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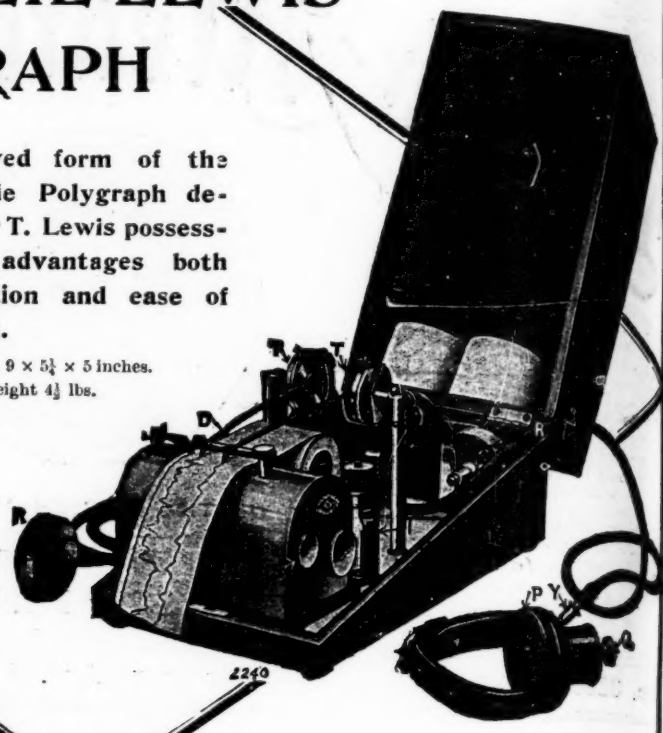

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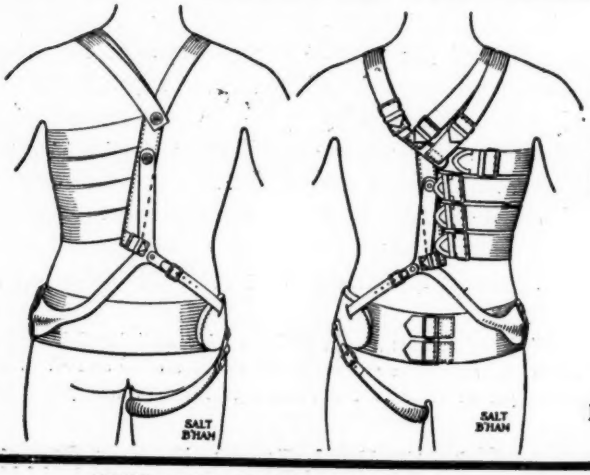

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A Lecture
on
INSULIN.

Delivered to
A General Session of the Eleventh International Physiological Congress, Edinburgh,
by

J. J. R. MACLEOD, M.B., Ch.B., F.R.S.,
Professor of Physiology in the University of Toronto.

Speaking for my collaborators, as well as myself, I wish to assure you that we consider it a very great honour that an account of our researches on insulin should be given so prominent a place on the programme of the XIth International Congress of Physiologists. In accepting the invitation to address you on this work, I fully realize the great responsibility that I have assumed, the more so since at the present time there yet remains so much that is obscure and unfinished, particularly with regard to the physiological aspects of the subject.

There is no other problem in the whole vast field of medical science that has attracted such diverse groups of workers as that of the relationship between the pancreas and disturbances in carbohydrate metabolism. Anatomists, pathologists, biochemists, physiologists, and physicians have contributed much to it, each adding some new and fundamental fact, and the knowledge thus acquired has formed the foundation upon which the present investigations depend. I shall not occupy your time here with a review of this earlier work except in so far as it is essential to an understanding of its relationship to these investigations.

Historical.

Towards the end of the seventeenth century Brunner, in his celebrated researches on the digestive functions of the pancreas, had occasion to remove the gland, and he described symptoms in the operated animals which were without doubt those of diabetes. This was, however, some time before the disease had come to be recognized as a clinical entity, and it was not until considerably later that physicians began to point out the frequent occurrence of morbid changes in the pancreas of patients who had died of it. The clue which this observation offered suggested to experimentalists, among them Claude Bernard, the advisability of seeing whether removal or destruction of the pancreas might cause diabetes. The experiments were without success until 1885, when von Mering and Minkowski announced their well known discovery, as a result of which Minkowski subsequently published a complete account of the pathological chemistry of the diabetic condition as observed in depancreated animals. As the cause of the diabetes Minkowski suggested the removal from the organism of "a something" that is essential for the metabolism of carbohydrates. He clearly meant an internal secretion, although it is in the writings of Lépine that for the first time we find this term actually used in connexion with the pancreas. But the existence of an internal pancreatic secretion could not be considered as an established fact until it could be shown that the administration of an extract of the gland to depancreated animals is capable of removing the diabetic symptoms, and this none of the investigators of this period could succeed in doing. These failures led some to suppose that the pancreas must control the metabolism of carbohydrate otherwise than by an internal secretion, although the majority considered that it was merely owing to destruction of the active principle during the preparation of the extracts that the failure to obtain it in extracts was due.

At the same time as these experimental investigations were in progress most valuable work was being done on the minute anatomy of the pancreas, particularly with regard to the islets of cells which had been described in 1869 by Langerhans as distinct and separate from the secreting acini. Among these workers I cannot refrain from paying tribute to Laguesse and Diamare and, among more recent workers, to R. R, Bensley, and their respective collaborators. This work established the essential independence of the cells of the islets and acini, and, since the latter were obviously concerned in the production of the digestive secretion of the gland, it was postulated that those of the islets must be responsible for the internal secretion that controls the metabolism of sugar. This hypothesis was greatly strengthened by experimental and pathological evidence. Minkowski and Hédon and, later, W. G. Macallum, demonstrated that when a small portion of the pancreas is transplanted under the skin, the main gland can be completely removed without any symptoms of diabetes supervening. Schultze and Ssobolew, independently, found that complete blockage of the secreting ducts is followed by a degeneration which involves the cells of the acini, but not those of the islets. This was more or less confirmed by other investigators, and furnished strong support for the islet hypothesis, since no diabetic symptoms were observed in the operated animals. Finally, pathologists, particularly Opie, described definite histological changes in the islet cells in patients dying of diabetes mellitus.

But all this evidence, strong though it might be, could not be considered as affording positive proof that the pancreas produces an internal secretion necessary for the control of the metabolism of sugar, and renewed attempts to demonstrate its presence in pancreatic extracts did not meet with sufficient success to prove convincing. That this would ultimately be achieved, however, was apparent to many, and to none more so than to the President of this Congress, Sir E. Sharpey Schafer, who, by suggesting the name Insulin for the hormone, indicated his belief that its source is the isles of Langerhans.

The most successful attempts to prepare pancreatic extracts containing insulin were made by Zuelzer, who, in 1908, showed that alcohol extracted from pancreas which had previously been subjected to a certain degree of change by ligation of its veins, a substance which was capable, when injected subcutaneously, of preventing the rise in blood sugar and the glycosuria which ordinarily follows injection of epinephrin. Zuelzer carried his investigations far enough to show that alcoholic extracts of beef pancreas could also remove many of the symptoms of diabetes in man, but, unfortunately, he failed to establish the therapeutic value of his product because of certain toxic symptoms which followed its administration. It is possible that these may have been due, in part at least, to an excessive lowering of the blood sugar which we now know to be associated with peculiar symptoms? From this time on the problem of attempting to produce extracts of the pancreas containing insulin fell to the lot of experimentalists, among whom may be mentioned Knowlton and Starling in this country, and E. L. Scott, J. R. Murlin, and Cramer and I. Kleiner in America, but with only occasional success.

Recent Researches.

We may take up the recent researches on insulin at this point; they had their origin in a suggestion, made by F. G. Banting, that since it was probable that the failure to preserve the active hormone in extracts of pancreas was due to the presence in them of proteolytic enzymes which would destroy it, the action of these might be circumvented by extracting glands that had been caused to undergo degeneration by previous ligation of the ducts. With the collaboration of C. H. Best, Banting ligated the ducts of the pancreas in several dogs, and a few weeks afterwards killed the animals by chloroform, quickly excised the partially degenerated residue of the gland, and extracted it with ice-cold Ringer's solution by grinding in a mortar with sand. Intravenous injection of the extract into depancreated animals was found to cause prompt and decided lowering of blood sugar, accompanied by a fall in the sugar excreted in the urine without any change in the percentage of haemoglobin in the blood. That the treated animal had regained some of its lost power to utilize carbohydrates was demonstrated by comparing the sugar balance, following administration of a measured amount of sugar, with and without the extract. Incubation of active extract

with trypsin in alkaline reaction was found to remove its hypoglycaemic action, which was not the case when faintly acid extract was incubated without trypsin. Similarly prepared extracts of spleen and liver had no effect, neither had otherwise active extracts of pancreas when given by mouth or by rectum.

These results, confirmed many times, seemed sufficient to prove the existence of the elusive pancreatic hormone, and the next problem was to devise a method by which it could be extracted from pancreas obtained from the abattoirs. As a step to this, Banting and Best took advantage of the fact, established by Ibrahim, that up to four months of foetal life in the ox the pancreas does not contain active proteolytic enzyme, although there is evidence, furnished by the experiments of Carlson and Drennan, that the antidiabetic hormone is produced by the gland during foetal life. They found that active extracts could be prepared from the pancreas of the foetal calf, and they carried the search with success to adult pancreas, using alcohol, as had previously been suggested by E. L. Scott and Zuelzer, as the extraction fluid, in the hope that in this medium proteolytic destruction of the hormone would not take place. Larger quantities of extract being now available, they succeeded in keeping a depancreated dog more or less constantly under the influence of the extract for a period of over two months, during which the animal gained in weight and exhibited only in slight degree the characteristic general symptoms of diabetes.

The criticism has been made that Banting and Best's experiment in which simple extracts of duct-ligated pancreas were used formed no essential step in the investigations which have given us insulin. I need scarcely reply to these criticisms. They were apparently made without any appreciation of the real obstacle that stood in the way of development of the subject—namely, convincing evidence that an antidiabetic hormone does actually exist in the pancreas—and to Banting and Best is due the credit of furnishing this by experiments of a different type from those of their predecessors. We owe much to the initiative, skill, and patience they displayed in completing this first essential step in the investigation.

It now became apparent that attempts should be made to see whether the crude alcoholic extracts of ox pancreas could be sufficiently freed from those substances which made them unsuitable for subcutaneous administration to diabetic patients, either because of local irritation or general toxic effects. At this stage of the investigation we were joined by J. B. Collip, who, in a remarkably short time, succeeded in isolating from the alcoholic extracts, by fractional precipitation with alcohol, a precipitate which contained the antidiabetic hormone in high concentration, and which, in watery solution, could be injected subcutaneously in man without any deleterious effects. At the same time it was also discovered that the blood sugar is lowered in normal rabbits by subcutaneous injection of extracts containing the antidiabetic hormone, and to this observation was due in large part the rapid progress which it was possible to make in the isolation of insulin. It offered a ready means for testing the relative potency of the various precipitates and filtrates, and of determining the most favourable conditions under which extraction of the gland should be carried out.

Provided with a comparatively simple method for the preparation of insulin, it now became possible to undertake a systematic investigation of its physiological and chemical properties and its possible therapeutic value, and I shall endeavour to describe briefly what has been found, and to indicate, in a general way, what appear to be the most hopeful lines for further research. It seemed advisable at this stage to group the problems demanding immediate investigation, and this was done as follows:

1. The effect of insulin on the respiratory exchange, the distribution of glycogen, and the metabolism of fat in animals rendered diabetic by pancreatectomy.
2. Its therapeutic effect in diabetes mellitus.
3. Its effect on the blood sugar of normal animals and the symptoms which result from overdosage.
4. Its pharmacological assay.
5. Its effect on the blood sugar in the various forms of experimental hyperglycaemia.
6. The physiological mechanism by which it lowers the blood sugar.
7. Its source.
8. Its chemical reactions and its preparation on a large scale.

In planning the investigations of these problems we were in the fortunate position of having the whole-hearted collaboration of several trained workers, not only in my own department (E. C. Noble, J. Hepburn, and J. K. Latchford), but also in that of internal medicine under the direction of Professor Duncan Graham (W. R. Campbell and A. A. Fletcher). We were also afforded, by the Connaught antitoxin laboratories of the University under the direction of Professors J. G. Fitzgerald and R. J. Defries, the facilities necessary for the preparation of the extracts on a large scale, and through the generous support of the University and the Carnegie Corporation it was made possible later to add several others to the group of workers.

THE EFFECT OF INSULIN ON THE METABOLISM OF CARBOHYDRATES AND FATS IN EXPERIMENTAL PANCREATIC DIABETES.

From the time carbohydrates are absorbed, mainly as glucose, into the blood of the portal circulation until they are completely oxidized, changes in chemical structure are constantly occurring. These consist, partly, in a condensation of several glucose molecules to form glycogen, and partly in a splitting of the molecule, proceeding through various intermediate stages. The intermediary substances formed at each stage are doubtless in a certain state of equilibrium, one with another. Many of them do not accumulate sufficiently to be detectable by chemical means, being changed into the next stage almost as quickly as they are produced, and at the present time we are limited, in our attempts to follow the various steps in the process, to observations on the concentration of glucose in the blood, the amount of glycogen deposited in the tissues, and the type of combustion occurring in the organism as a whole. In diabetes marked and significant alterations occur in each of these; the blood sugar rises to a high level, glycogen practically disappears from the liver and becomes decreased in the muscles—except the heart, in which it increases—and the nature of the combustion process, as revealed by the behaviour of the respiratory quotient, becomes changed so as to indicate that no carbohydrate is being oxidized. It is safe to assume that the increase in blood sugar is secondary to the other changes, but it is difficult in the present state of knowledge to understand the relation. It has been a favourite hypothesis that the primary fault in diabetes is in the oxidation of glucose, or in the chemical changes which precede, and that this leads to the drafting to the tissues from the glycogen reserves of a plethora of sugar; a sort of forced-feeding process, as it were. Another hypothesis is that the glucose molecule must become altered in some way before it can be either oxidized or condensed into glycogen, and that this alteration does not occur in diabetes. Through the work of Irvine and his school much light has been thrown in recent years on the structure of the sugar molecule, and it has been shown that besides the well known α and β varieties of glucose, in which the oxygen linkage is between the first and fourth carbon atoms, there is also a third variety, called γ glucose, in which the oxygen ring is displaced from the normal stable position. The detection of the γ sugars depends mainly on a comparison of the reducing and polarizing powers of the solutions, and, by using this method, Winter and Smith have recently published results which they interpret as showing that the alteration in the glucose molecule alluded to above is the production of γ glucose. According to this view, γ glucose is a necessary preliminary stage in the oxidation of glucose, and, if we suppose that it is also so for its condensation into glycogen, the interrelation of the three changes found in diabetes becomes immediately intelligible.

I have dwelt on these theoretical considerations because of their great interest in connexion with the mechanism of the action of insulin. For it is a significant fact that this hormone, when administered to depancreated animals, completely restores to normal each of the three functions. We have repeatedly found, for example, that when it is

given along with carbohydrate to depancreated dogs, very large quantities of glycogen become deposited in the liver and that the respiratory quotient becomes raised in the same manner as it does in normal animals with carbohydrate alone. We know also from the work of Banting and Best on depancreated dogs that it reduces the blood sugar to the physiological level, that the glycosuria disappears, and that the well-being of the animal becomes normal in every regard.

We must conclude, therefore, that insulin is necessary for the metabolism of carbohydrate, and we may suppose that its function is in some way related to the preparation of the glucose molecule for combustion and condensation. But as to whether this preparation consists in a change of α, β glucose into the γ variety cannot as yet be considered as settled. Dr. G. S. Eadie[1] has repeated Winter and Smith's observations, and by strictly following their instructions has obtained similar results. Briefly stated, these results are that after removal of the proteins by phosphotungstic acid and alcohol from normal blood, the dextrorotatory power of the filtrate is lower than it should be as calculated from the reducing power, and on standing twenty-four hours the differences become less, and later they practically disappear. On the other hand, when blood from diabetic patients or hyperglycaemic animals is used, the dextro-rotatory and reducing values correspond from the start, or the former may exceed the latter. Administration of insulin causes the diabetic blood to behave in these regards like normal.

The question is with regard to the interpretation of the results; as Hewlett has pointed out, this need not necessarily be that γ glucose is present, but rather that chemical changes have occurred in the very complicated procedure which is involved in the preparation of the solutions for the polariscope. Others have believed that the blood may contain, besides glucose, other carbohydrates or related substances having a relatively low dextro-rotatory power. Since this question is not yet settled I need not dwell on the further claim of Winter and Smith that insulin is capable of causing γ glucose to be formed when added to a solution of ordinary glucose along with an extract of liver. I may state, however, that we have so far been unable to confirm this result.

The action of insulin on the metabolism of fat in diabetic animals is as striking as on carbohydrates, and here again its effects are revealed by chemical changes occurring at both ends, as it were, of the metabolic chain. In a few days after pancreatectomy in the dog, the blood and the liver contain excessive quantities of fat, although the extreme degrees of lipaemia sometimes encountered in diabetic patients have not been observed. There is also a certain degree of acetonuria, although again this is much less pronounced than it is in diabetes in man. Evidently the migration of fat in the body is abnormal, and its final oxidation seriously interfered with. When insulin is given along with carbohydrates to these animals, the acetonuria very promptly disappears, the blood fat, apparently more slowly, returns to normal, and the liver in a few days contains no more fat than that of a normal, similarly fed animal. As the glycogen increases in this viscus the fat correspondingly declines. We cannot state at which stage in the metabolism of fats insulin exercises its corrective influence, but wherever this may be there can be little doubt that it acts indirectly because of its effect on carbohydrates. It has been said that fat burns in the fire of carbohydrates, and although this generalization may, in some respects, be misleading, it is, nevertheless, a useful guide in interpreting the results with insulin.

The Therapeutic Effects of Insulin in Diabetes Mellitus.

As would be expected, the effects of insulin on patients suffering from diabetes mellitus, in so far as these have been studied, are of the same general nature as those observed on diabetic (depancreated) dogs. Until the laboratory investigations had furnished perfectly definite results no serious attempts were made to carry the investigations into the clinic, nor would it have been permissible to do so in view of the failures of previous workers to provide an extract that did not cause toxic symptoms. Without animal experimentation we would be no further to-day in the treatment of diabetes, and in the undoubted saving of human life which has been the result, than we were a little over a year ago when the treatment was first applied on any considerable scale.

In studying the results obtained by administration of insulin to patients, we must bear in mind that two factors may come into play that are not involved in the experiments on completely depancreated animals. One of these is dependent on the fact that there probably still remains in the majority of diabetic patients a certain remnant of pancreatic tissue capable of secreting insulin. The other is dependent on certain differences between laboratory animals and man, related in part to peculiarities in the type of metabolism and in part to the greater development of the nervous system, to which the frequent occurrence of coma as a serious symptom of the clinical form of the disease is due. Moreover, we must remember that subjective phenomena can be studied only in man.

The first case in which a complete study of the therapeutic value of insulin was made was that of a boy fourteen years of age, exhibiting all the classical symptoms of the disease; treatment by dietetic control had resulted in no improvement. Daily injections of insulin between January 23rd and February 4th, 1922, reduced the blood sugar, even to the normal level, greatly diminished the glycosuria, and often caused it to disappear, removed entirely the ketonuria for a period of some days, and, perhaps most striking of all, "the boy became brighter, more active, looked better, and said he felt stronger." There could be no doubt as to the great therapeutic value of the treatment when judged both by the improvement in the objective and subjective symptoms of the disease. This, along with other cases treated by insulin, and reported by Banting, Best, Collip, Campbell, and Fletcher, is only the first of a large number, exhibiting the disease in all its forms, that have been most carefully studied in numerous clinics both in Canada and the United States and in Great Britain, and I cannot refrain from expressing my admiration for the excellent spirit of collaboration which has made this possible. I am not qualified, nor even if I were would it be in place for me here, to discuss further the clinical results, but I may say that there can be no doubt that insulin is capable, when wisely used under controlled conditions, of saving many cases of diabetes which would otherwise inevitably succumb to coma, or to one of the many other complications of the disease. It is also certain that as an adjunct to dietetic control, treatment with insulin greatly improves the nutritive condition and increases the resistance towards infections, thereby prolonging the expectation of life. The subjective condition and the sense of well-being of the patients are also vastly improved. As to whether continued treatment with insulin will enable the diabetic patient to recover any of his lost power of producing this internal secretion in his own pancreas, nothing definite can be said at present. It is at least significant in this connexion that the islet tissue develops considerable powers of regeneration after much of it has been destroyed as a result of ligation of the secreting ducts of the pancreas, as has been shown by R. R. Bensley to happen, at least in the rabbit and guinea-pig. Arising as it does in these cases from outgrowths of the duct epithelium, may it not be possible in man, in whom the pancreas has not been completely destroyed by disease, that new islet tissue will become regenerated when, by administration of insulin, the strain to produce this hormone endogenously is removed?

The Effect of Insulin on the Blood Sugar of Normal Animals.

Returning now to the more purely physiological aspects of the subject, let me briefly lay before you what is known regarding the effects of insulin on normal animals. In the consideration of these results we must bear in mind that the conditions in the normal animal are fundamentally different from those obtaining in the diabetic. In the normal animal there is probably available at all times a sufficient amount of insulin for every purpose for which it is required, so that the addition of more from without

upsets the metabolic balance and thereby induces an abnormal state. In the diabetic, on the other hand, the injection of insulin only restores to the body a hitherto missing part of the metabolic machinery and enables it to run smoothly again.

Within a few minutes of the intravenous or subcutaneous injection of a moderate dose of insulin, the percentage of sugar in the blood begins to fall, and it continues to fall, more or less in a straight line, for a period which varies from about half an hour to several hours, according to the animal; afterwards the curve may gradually become less steep or it may begin to rise again.

The prompt onset and the steep nature of the fall in blood sugar are characteristic features of the action of insulin, and are quite unlike the hypoglycaemic effects that may be produced by administration of other substances, such as phosphorus or the insulin-like materials that have been prepared by Collip and others from clams and from various vegetable sources. Indeed, the character of initial fall is such as to give the impression that the process responsible for it must be one operating within the blood itself—an intravascular glycolysis. But this cannot be the case, since we have been unable to find that the addition of insulin to defibrinated blood kept under sterile conditions at body temperature outside the body has any influence on the rate at which sugar disappears; neither is there any difference in this regard between the blood of normal animals and that of animals injected with insulin at varying periods preceding the withdrawal of the blood. Evidently, therefore, the locus of action of insulin is extravascular; it is in the tissue cells. We must conclude that the insulin sets up some process by which, as it were, a vacuum for sugar becomes established in these cells, so that sugar is removed from the blood. One may imagine that in the tissues there exists a certain balance between the concentration of free glucose, the complex carbohydrates from which it may be derived, and the various derivatives into which it breaks down prior to its oxidation. In other words, one may speak of a certain tension of glucose as being necessary in the tissues and consider the action of insulin as having the effect of reducing this tension so that glucose diffuses into them from the blood in order to maintain it.

After about half an hour the blood sugar in the rabbit usually begins to rise again, or at least the fall to become much less pronounced, indicating that the effect of insulin is becoming neutralized by the liberation of sufficient glucose from the glycogen stores of the muscles and liver. This, of course, means that the hypoglycaemia following insulin will be much more prolonged and will ultimately become much more pronounced in animals provided with small reserves of glycogen than in those that are rich in glycogen. Such can readily be shown to be the case, and it is significant that a well fed animal may withstand many times the dose of insulin that would prove fatal to one that was starved.

It is customary to imagine that the glycogenic mechanism of the liver is so finely attuned to respond to the concentration of sugar in the blood that glycogenolysis immediately sets in when this falls below the normal level. That such is not the case following insulin may depend on the fact that the glycogen, which is first of all called upon to maintain the glucose tension in the tissues, is that of the muscles themselves; but I will not here venture further into the various interesting consequences of such an hypothesis. It is at least significant that the glycogen of the muscles, as well as of the liver, is usually reduced in animals that have been given large doses of insulin (McCormack and O'Brien and Dale and Dudley). On account of its practical significance it should be pointed out that it is because of the poverty of the glycogen reserves that the blood sugar of diabetic patients treated with insulin is more apt to fall suddenly to a dangerously low level than in normal persons.

THE HYPOGLYCAEMIC SYMPTOMS.

When the percentage of blood sugar has fallen to about 0.045, curious symptoms supervene. They were first observed in rabbits, and in a typical case consist of a violent convulsive seizure in which the animal throws itself over sideways, usually first in one direction, then in the other, with the head retracted and the hind limbs in an extended position.

The condition is not unlike that caused by strychnine or by acute asphyxia, except that certain groups of muscles are less affected by the convulsions than others. After a period, usually of from 30 to 60 seconds, the convulsions cease and the animal lies on its side in an unconscious state, with rapid, shallow breathing, and perhaps showing running-like movements of the extremities. The exact condition of the animal at this stage may, however, vary considerably; well fed and therefore glycogen-rich animals often sit in apparently normal fashion between the convulsive seizures, which are often brought on by attempts to move. After a varying period the comatose stage is followed by another convulsive seizure, and these phases may continue alternately for an hour or more, the convulsions becoming feebler and feebler and the rectal temperature falling, until at last the animal dies of respiratory failure. After death rigor mortis sets in at once. The arterial blood is venous in colour and clots very quickly. Preceding the onset of typical convulsions there are usually premonitory symptoms of hyperexcitability and evidence of hunger; sometimes, however, paralysis of the extremities is the first symptom.

The symptoms vary somewhat in other animals. In the dog the first signs are usually very rapid breathing, restlessness, and general hypersensitivity; muscular twitching then becomes evident and the sphincters may relax. Barking is often a prominent symptom, and there may be frothing at the mouth. At this stage, or as the first symptom, convulsions not unlike those seen in the rabbit may supervene, and between them the animal lies on its side, showing violent twitching of the musculature, almost a tetany. It is evidently unconscious. The rates of breathing and of the pulse increase; inspiration is usually short and jerky, and inspiratory tetanus not infrequent, so that artificial respiration may have to be applied. Attempts to get on its feet often cause convulsive seizures, and, during recovery, the muscles of the extremities, particularly the anterior, are seen to have entirely lost their power of co-ordinate action. In etherized dogs even massive doses of insulin have no immediate effect on the blood pressure.

In the cat the symptoms are like those in the dog, profuse salivation, mewing, and relaxation of the sphincters being especially marked.

In the mouse kept at room temperature, A. Krogh observed that insulin may only cause the animal to become weak, but its temperature falls to a very low level. If it be kept in an incubator at about 28° C., however, characteristic symptoms supervene—convulsions and coma, preceded by paralysis of the legs—with doses of insulin, which, when compared on a body-weight basis, are only about one-fifth that necessary for rabbits.

This influence of body temperature is particularly interesting, since it probably explains the apparent immunity of frogs even to massive doses of insulin. We failed to note any symptoms even in three days after injecting insulin, but A. Krogh has since found that they occur in a day or so later—a fact which we have confirmed.

In man, in whom the subjective symptoms can be interpreted and cardio-vascular changes more accurately observed, the picture is different. When the blood sugar reaches about 0.075 per cent. the patient experiences extreme hunger and a sense of fatigue. He usually becomes anxious and may lose his emotional control. Actual tremor of the musculature is rarely seen, but there is a definite sense of tremulousness and some inco-ordination for fine movements. "Vasomotor phenomena are common; pallor or flushing, sometimes one after the other; a sense of heat, of chilliness, almost always a profuse sweat" (Banting, Campbell, and Fletcher). At lower levels of blood sugar, acute mental distress, mental disturbances, delirium, and finally coma, with loss of the deep reflexes, supervene.

The correspondence between the onset of definite objective symptoms and a blood sugar percentage of 0.045 in laboratory animals is remarkable. Sometimes, as in starved animals receiving a large dose of insulin, the blood sugar may be found to be considerably below this level when convulsions first appear. Very occasionally it is decidedly higher, and immediately after a convulsion the sugar may rise somewhat. These facts suggest that the symptoms are the result of the lowering of the tension of glucose in the tissue cells below a certain critical level—a condition of "glucatonia," we may call it—to which the hypoglycaemia runs parallel. This view is supported by the striking manner in which the symptoms are almost instantly removed by administration of glucose, and it is of great significance that other hexose monosaccharides have only a slight beneficial effect, although of course their injection causes a marked rise in the reducing power of the blood. Mannose and laevulose seem to be somewhat more efficient than galactose. None of the pentoses or disaccharides has any effect. Injection of epinephrin, subcutaneously, also removes the symptoms, no doubt because

it excites the production of glucose out of the glycogen reserves. It is of use, therefore, only when these reserves are considerable, and should not be depended upon to antidote the symptoms of glucatonia in diabetic patients, because in them the glycogen stores are apt to be low. A similar relation between the percentage of blood sugar and convulsive symptoms had previously been described by Mann and Magath in dogs deprived of the liver; administration of glucose also removed the symptoms, other monosaccharides having only a slight effect.

There can be little doubt, then, that the symptoms are related to a lowering of the glucose tension in the tissues. But we cannot imagine that this, in itself, is responsible for the violent stimulation of the respiratory and muscular centres that evidently occurs. Some unphysiological condition must become developed as a result of the glucatonia, and it has been suggested that anoxaemia may be an important factor. Olmsted and Logan point out that there is a remarkable resemblance between an insulin convulsion and an asphyxial convulsion, and that the arterial blood is invariably intensely venous in colour when convulsions supervene. "It may possibly be that through the lowering of blood sugar certain oxidative processes become depressed to such a degree that the brain cells are affected in much the same manner as in asphyxia." Whatever may be the nature of the toxic condition, it is clearly on the cells of the pons and medulla that it acts. It does not, like strychnine, act on the motor centres of the spinal cord, since insulin causes no convulsive symptoms in a decapitate cat, although it may lower the blood sugar to well below the convulsive level (Olmsted and Logan).

On what particular detail in the chemical structure of the molecule the remarkable specificity of glucose in antidoting the symptoms may depend cannot as yet be said, but it is evident that, by studying the relative antidoting value of various sugars and substituted sugars, we are furnished with an interesting method for determining the biological significance of the different side-chains and of the other molecular arrangements of the glucose molecule.

The Pharmacological Assay of Insulin.

The extent to which insulin lowers the blood sugar forms the basis for its pharmacological assay, one unit being originally defined by us as the amount which is required to lower it to 0.045 per cent. within four hours in a rabbit weighing two kilograms and after twenty-four hours' fasting.

Since convulsions supervene at this level, their occurrence can be used as a check on the assay, and when small animals, such as mice, are used, so that large numbers can be injected with varying amounts of insulin, it can be made by observing the onset of the symptoms alone. In this case one mouse unit is defined by A. Krogh as the quantity of insulin which can cause convulsions in 50 per cent. of the animals within two hours, precautions being taken to maintain the body temperature and to standardize the diet. Dale and Burn have also tried this method of assay.

Even when rabbits are carefully selected so as to correspond in weight and in every other particular, are similarly fed prior to the preliminary starvation period, and are injected intravenously so as to obviate any uncertainties in rate of absorption, the assays, as judged either by the blood sugar curve or the occurrence of convulsions, do not always correspond. Differences in glycogen content, which can never be accurately adjusted by dieting, are probably largely responsible. We have attempted to circumvent these difficulties by confining the observations on the blood sugar to the first half-hour after the insulin injections, hoping in this way to circumvent the influence of the glycogen reserves, but with no conspicuous success. Probably the most accurate method of assay is that worked out in Toronto by Dr. F. N. Allen on depancreated dogs. The principle of this method, which was suggested by our clinical associates, is to determine the number of grams of glucose that a given quantity of insulin can cause to be metabolized while the animal is on a diet containing enough carbohydrate so that there is some glycosuria. He has found that the carbohydrate equivalent of insulin, as it is called, varies somewhat with the weight of the animal and the carbohydrate balance, but that it is satisfactorily constant when these conditions are made uniform. It is not likely that this method will succeed in the clinic, because of the varying degree to which different diabetic patients retain the power to produce insulin.

I have said enough about this problem of assay to indicate how difficult it is. It is probably advisable to point out, however, that it has been found advantageous to adopt, for clinical purposes, temporarily at least, a unit which is one-third that of the standard unit as defined above. This is done to obviate the necessity of prescribing fractions of a unit for the treatment of mild cases of diabetes.

The Effect of Insulin in Experimental Hyperglycaemia.

Insulin also lowers the blood sugar in every known form of experimental hyperglycaemia, whether this be produced by the addition of glucose exogenously or endogenously. With regard to the former type, Eadie has found that when insulin is injected into rabbits coincidently with, or at varying periods preceding, the injection of sugar the curve of the resulting hyperglycaemia becomes greatly altered. When the insulin injection coincides with that of sugar the curve rises to the same height as with sugar alone, but it returns much sooner to the normal level, and when the sugar is given some time after the insulin the curve is not only of shorter duration but is also much less in height. The maximal influence of insulin in suppressing the curve is when the sugar is given at an interval of about 75 to 90 minutes after the insulin. At longer intervals the curves progressively rise again, the suppressing influence of insulin having, as a rule, disappeared in about eight hours. We have attempted to use these facts as the basis for a method of assay, but with no great success.

Of the endogenous forms of experimental hyperglycaemia, we have studied the effect of insulin on those due to piqûre, to epinephrin, to asphyxial conditions, and to anaesthetics, and Stewart and Rogoff have studied it on the peculiar form due to morphine. The hyperglycaemia which becomes rapidly developed in glycogen-rich rabbits in all these conditions is greatly diminished, if not entirely absent, in animals injected with insulin, this depending, obviously, on the amount injected. Most attention has been paid to epinephrin hyperglycaemia, because in this case alone is it possible to control the intensity of the hyperglycaemia by varying the dosage. This, it will be seen, offers a method for the assay of insulin, and Eadie has found that when equal quantities of epinephrin are injected into a series of uniformly fed rabbits along with varying quantities of insulin, there is usually a definite mathematical relation between the dose of insulin and the extent to which the blood sugar rises.

Further interest attaches to the antagonistic action between insulin and epinephrin, with regard to the blood sugar, because they are both hormones, although it is questionable whether the hormonic action of epinephrin is of importance to the animal. It is significant in this connexion that Stewart and Rogoff have found that the hypoglycaemic effect of insulin is not perceptibly different in adrenalectomized than in normal animals, thus showing that the adrenals are in no way linked with the internal secretion of the pancreas in the control of sugar metabolism.

The observation that insulin can prevent the hyperglycaemia due to ether is of clinical importance, because it is probably on account of this hyperglycaemia that a large part of the risk of surgical operations on diabetic patients is due. It should be pointed out, however, that the hypoglycaemic action of insulin is much more readily demonstrated by having the animal well under the effects of insulin before the ether is administered, than by giving insulin to animals that are already anaesthetized. This would seem to indicate that diabetic patients should be treated with insulin before being anaesthetized, and, indeed, that this preliminary treatment should extend over several days so that the reserves of glycogen may be augmented. I am informed by my clinical colleagues that insulin is of little avail in combating post-operative coma if its administration is delayed until after the operation.

An interesting antagonism between pituitrin and insulin has been described by Burn. Given in large doses, pituitrin, like insulin, may inhibit the hyperglycaemia due to epinephrin or to ether, but when insulin and pituitrin are given together to normal animals, instead of there being a greater fall in blood sugar than insulin alone would produce, there

is little change, or, it may be, a rise. A dose of pituitrin which in itself has little effect on blood sugar is thus capable of neutralizing the hypoglycaemic action of insulin. This observation has been confirmed by Logan and Olmsted, who have also found that it is necessary to give enormous amounts of insulin to cause any decided decrease in the hyperglycaemia which is present in decerebrate cats still retaining the pituitary gland. When this gland is absent, on the other hand, not only is the hyperglycaemia much less pronounced, as Bazett had suggested it would be, but insulin promptly lowers the blood sugar and hyperglycaemic convulsions can readily be induced.

All of the forms of experimental hyperglycaemia just alluded to are primarily due to a rapid breakdown of the glycogen of the liver, and that produced by epinephrin may therefore be taken as a type. This does not, of course, warrant the assumption that some have made, that a hypersecretion of this hormone is the underlying cause of the hyperglycaemia in the other forms. Indeed, Stewart and Rogoff have conclusively shown that such is not the case, with the possible exception of that caused by morphine. Taking epinephrin hyperglycaemia as a type, then, it seemed of interest to compare the amount of glycogen left in the livers of uniformly well fed rabbits after they had been given equal doses of epinephrin, some of them at the same time also receiving insulin. This observation, made by E. C. Noble, has shown very definitely that the insulin protects the glycogen against breakdown. In one experiment, lasting eight hours, the livers of two animals receiving epinephrin alone contained 1.40 and 1.96 per cent. of glycogen, whereas those of three others which were given insulin along with the same amounts of epinephrin contained 8.12, 6.4, and 3.64 per cent. of glycogen. It is of interest to note that it was necessary to give about forty times the usual dose of insulin to cause convulsions under these conditions, and that sometimes the convulsions occurred while there was still over 10 per cent. of glycogen remaining in the liver. The results show quite clearly that insulin antidotes the glycogenolytic action of epinephrin.

The Physiological Mechanism by which Insulin lowers the Blood Sugar.

We are now arrived at a stage where it will be advantageous to consider briefly the possible mechanism of the hypoglycaemic action of insulin. We have presented evidence that this is not because it stimulates increased glycolysis within the blood itself, and have concluded that insulin in some way lowers the tension of glucose in the tissue cells.

Further evidence that insulin causes the sugar to pass from the circulating fluid into the tissues more quickly than normal has been furnished by perfusion experiments on the isolated mammalian heart.

Hepburn and Latchford, using Locke's method, found, as previous workers have, that an average of 0.9 mg. of glucose per gram of (rabbit) heart per hour disappears from the perfusion fluid. By adding insulin to the perfusion fluid the average sugar consumption rose to over 3.0 mg., and in some cases reached the value of over 4.0 mg., the highest without insulin being below 2 mg. They did not find that insulin affected the heart beat, nor could they detect any significant differences in the glycogen content of the hearts used in the two groups of experiments.

Hoping to be able to demonstrate a similar effect of insulin on the sugar content of fluid perfused through skeletal muscles, these workers attempted to perfuse the hind limbs of various laboratory mammals, but, although every possible precaution was taken to avoid interruption of the circulation prior to starting the perfusion, or a fall in temperature, they could never succeed in preventing either marked oedema or vaso-constriction. This failure led them to compare the sugar concentration of blood removed at the same time from the femoral artery and vein, and from the portal vein, of anaesthetized or decerebrated animals, and to see whether insulin would cause the differences normally existing between these bloods to become changed. It was found not to do so. McCormack has since found that this method is also incapable of revealing an increased retention of glucose as a result of insulin, either in the muscles or in the liver of depancreated animals, in which, as we have seen, insulin certainly causes glycogen to be formed. This shows that the method is not sufficiently sensitive for the purpose for which it was employed.

The evidence of the observations on glycolysis and the perfused heart leave little doubt, however, that the glucose is lost in the tissue cells, and the problem narrows itself down to the cause for its disappearance. The possibilities that may be considered are: its polymerization into glycogen, its oxidation, and its reduction to substances similar to fatty acids.

With regard to its possible conversion into glycogen, the fact that insulin causes large amounts of this polysaccharide to become deposited in the liver of depancreated animals when carbohydrates are given would seem at first sight to lend support. But the conditions, as already pointed out, are fundamentally different in the normal organism. As a matter of fact, it has been shown that insulin given to normal rabbits, instead of causing glycogen to be deposited, has the opposite effect, and either prevents the deposition of glycogen when it is given along with carbohydrates to previously starved animals (McCormack and O'Brien) or causes the stores of this substance to become reduced when given to well fed animals (Dale and Dudley).

Further evidence that insulin does not stimulate formation of glycogen in normal animals has been obtained by Noble by perfusion experiments on the liver of the turtle. When each of the two lobes is perfused for several hours with Ringer's solution containing glucose, under exactly similar conditions except that the fluid on one side contains insulin, the relative amounts of glycogen in the two lobes were found to be the same as they usually are. Since the normal variation may be considerable, the method is not a very delicate one, and on this account Noble has also used that of observing the sugar content of the perfusion fluid, as recommended by Snyder, Martin, and Levin. By comparing this for equal periods of time, with and without the addition of insulin, no differences could be detected. The only objection to the experiment is that insulin may not act quickly enough in the case of cold-blooded animals to make it possible in the time of perfusion for measurable quantities of glycogen to be deposited.

Clearly, therefore, none of the disappearance of sugar from the blood of normal animals which follows the injection of insulin can be accounted for by its polymerization to glycogen. Why, then, does insulin cause glycogen to be deposited in the diabetic animal, and why does it inhibit the breakdown of glycogen in experimental hyperglycaemia? The reply, based on the considerations already set forth, is that an excess of insulin, beyond that actually required for the control of carbohydrate metabolism, develops towards glycogen an action which is the reverse of that which it has under normal conditions. When insulin is given to the diabetic animal, on the other hand, it supplies a previously missing agency necessary for the oxidation and polymerization of glucose. To explain the retarding effect which insulin has on glycogen breakdown in experimental hyperglycaemia, we may suppose that the sugar which is produced by this process is a mixture of active and inactive forms, and that insulin, by tending to produce the former in relative excess, disturbs the balance existing between the sugars and glycogen, so that less glycogen is broken down. This suggestion assumes some sort of balanced action between glycogen and its hydrolytic products, for which, however, there is no experimental evidence.

The possibility that glucose disappears because excess of insulin causes its oxidation to be increased has been investigated by observing the respiratory exchange.

In the experiments of Dixon, Eadie, and Pember, dogs and rabbits were used. In the former, the results show that insulin causes a very marked increase in oxygen consumption and in respiratory volume and rate, but very little change in the respiratory quotient. These changes do not, however, begin to be evident until from 30 to 60 minutes after giving the insulin, by which time the blood sugar has completed its initial fall and stands at about 0.060 per cent., which indicates that the sudden call for sugar on the part of the tissue cells cannot be attributed to its increased oxidative breakdown. There can be little doubt that the increased metabolism is dependent upon the hyperexcitability and the increased muscular tone of the animal. It reaches its acme when convulsions supervene, and it develops either steadily or intermittently. Evidently, as the tension of glucose declines, conditions become established within the nerve centres which excite them and which may be dependent upon an intracellular lack of oxygen. That the development of the symptoms depends on the lowering of the glucose tension is supported by the observation that their severity is lessened by the injection of glucose.

In rabbits, in which it will be recalled increased muscular tone is not so marked a symptom as in dogs, the increase in oxygen consumption does not set in until the convulsions occur—indeed, there is often, if not usually, a drop both in this and in respiratory volume. Sometimes in rabbits the respiratory quotient rises decidedly. It would be rash at this stage to draw definite conclusions from these results, but it is quite plain that the initial fall in blood sugar, which is primarily what we must attempt to explain, is not due to any increased combustion of glucose.

The remaining possibility that glucose is reduced to substances related to the fatty acids receives some support in certain of the observations from the behaviour of the respiratory quotient. This may rise to over unity without

there being any sufficient degree of hyperpnoea, and of consequent "washing out" of CO_2 from the blood to account for it. To be quite certain of this latter possibility, Dixon and Pember have examined the blood removed from dogs at regular, frequent intervals after giving insulin without finding that there is any significant change in the CO_2-combining power. This observation, by the way, also shows that there can be no production of acid substances as a result of insulin, a fact which has also been demonstrated by F. N. Allen from observations on the behaviour of the acid excretion by way of the urine.

We are, therefore, at a loss to explain the cause for the initial disappearance of sugar from the blood; it is not converted into glycogen, its oxidation in the tissues is not augmented, at least until after increased muscular activity sets in, and if some of it does become reduced to fat-like substances this is not an invariable process.

The Source of Insulin in the Higher Animals.

The evidence that insulin is derived in the higher animals from the islets of Langerhans and not from the acinar (zymogenous) cells of the pancreas has, until recently, been of an indirect nature.

Continuing the work of Diamare and Laguesse on the comparative anatomy of the islets of Langerhans, Rennie, in 1905, described in detail their relationship to that of the zymogenous tissue in numerous Teleostei. He found, particularly in *Lophius piscatorius*, Myoxocephalus, and the Pleuronectidae, that the islet cells exist as separate encapsulated glands lying in the mesentery quite distinct and apart from the bulk of the zymogenous tissue, which is usually spread as narrow bands along the branches of the mesenteric blood vessels. These glands he called Principal Islets, and he found the largest of them to be situated near the anterior pole of the spleen.

Although the more recently discovered methods of differential staining for islet cells have not been successfully applied to the principal islets, no one has doubted the conclusion of Diamare and Rennie that they are homologous with those of the islets of Langerhans of the mammalian pancreas. The absence of these structures in the zymogenous tissue in the Teleostei supports this view, as does also the fact that in the Elasmobranchi, in which there are no principal islets, the pancreas itself, which is a compact gland, contains abundant islet tissue. In collaboration with Fraser, Rennie investigated the effect of the principal islets, administered by mouth, on diabetic patients, but without results that could be considered to show definite amelioration of the symptoms. In one case an extract of the gland was injected subcutaneously, but the development of toxic symptoms made a repetition of the experiment inadvisable. In view of the now well established fact that insulin is quite inactive when given by mouth, it is clear why these earlier observations should have failed to yield satisfactory results. Recently, we have reinvestigated the problem, and have found very definitely that alcoholic extracts of the principal islets cause a profound lowering of the blood sugar of normal and diabetic animals, including man, when they are injected subcutaneously or intravenously, whereas similarly prepared extracts of the zymogenous tissue have no such effect—indeed, not infrequently, rather cause the percentage of blood sugar to increase. In contrast to these results, an extract of the pancreas of the skate, which contains islet tissue, has a marked insulin effect,* and so also had one prepared from the intercaecal fat of the trout (in which the islets and zymogenous tissue lie separately embedded). The islets are, therefore, the only source of insulin in the bony fishes, and we may conclude that they are also so in the mammals, since in them none of this hormone is produced after pancreatectomy.

This conclusion is supported by the experiments on duct ligation and on grafting already referred to, and by the experiments of Banting and Best, although in all of these there still remained the possibility that partially degenerated or regenerated zymogenous tissue might be the source of the hormone.

Much attention has been given in recent years to the mechanism of control of the secretion of glands producing internal secretions, and, since many of those concerned in the production of external secretions are under nerve control, it has been supposed that this must also be the case with the ductless glands. It cannot be said, however, that much success has attended the various endeavours to demonstrate this nerve control. Since the islets of Langerhans are provided with a rich nerve supply, which is believed to come in large part from the right vagus, and since an increased discharge of their internal secretion, insulin, would be revealed by the behaviour of the blood sugar, McCormack and O'Brien have investigated the effect which is produced on the latter by electrical stimulation of the right vagus, in decerebrate cats and in etherized dogs and rabbits. To avoid cardio-inhibitory effects, the nerve has either been stimulated below the origin of the cardiac fibres, or it has been allowed to undergo partial degeneration. The fact that hyperglycaemia follows stimulation of the great splanchnic nerve further suggests the possibility that hypoglycaemia might result from stimulation of the vagus.

Similar observations were made some years ago by de Corral, working in Asher's laboratory, with results which are at least suggestive. Those of the present investigation are more definite, although not entirely convincing. In many cases no change can be detected in the level of the blood sugar following the stimulation, but in several others there is a prompt fall, which is usually of a temporary nature, in spite of continued stimulation. In one or two cases, however, stimulation with slow, weak induced shocks for a long period has caused a gradual decline in blood sugar, in one case to 0.070 per cent., with a return towards the normal level after removal of the stimulus. It is of great interest in connexion with these experiments that Best and Scott have recently discovered that insulin can be prepared from blood by the usual methods.

The Chemical Reactions and the Preparation of Insulin.

The method of preparation developed by Collip depends on the solubility of insulin in concentrations of ethyl alcohol up to about 90 per cent., above which it becomes precipitated.

Since most proteins are insoluble at concentrations of alcohol that are considerably below this, they can be removed from the original extract of pancreas (which is made with 50 to 60 per cent. alcohol) by fractional precipitation after the extract has been concentrated by evaporation *in vacuo*. A watery solution of the precipitate which settles out at a concentration of 90 per cent. alcohol is insulin. It can be evaporated to dryness *in vacuo* without loss of potency, and the powder contains about 14 per cent. of nitrogen, is free from phosphorus (Doisy, Somogyi, and Shaffer), but contains sulphur. A solution gives a distinct biuret test, but only faintly those of Millon and Hopkins-Cole. The insulin is readily absorbed by kaolin and charcoal, and considerable losses are apt to occur in passing it through a porcelain filter. It does not dialyse through membranes or collodion sacs; it is precipitated by half-saturation with ammonium sulphate, by barium salts of weak acids, and by picric acid. The solubility in water and alcohol is determined by the H-ion concentration, the iso-electric point being at a *p*H between 5 and 6. Watery solutions at a *p*H below 5 can be boiled for several hours without any loss in potency, but this occurs more rapidly when the *p*H is about 7. The potency quickly vanishes in the presence of pepsin or trypsin. In acid solution insulin is relatively stable to mild oxidizing and reducing agents. Insulin is also soluble in phenol and the cresols, glacial acetic acid, and formamide. It is insoluble in most other organic solvents (Malony).

These reactions, and its destruction by pepsin and trypsin, suggest that insulin is of the nature of an albumose, but it is possible that it is really only adherent to this protein, and is itself of much simpler chemical structure. This view is supported by the fact that we have been unable on several occasions to detect any biuret reaction with insulin prepared from the pancreas of the skate or to obtain from this source precipitates containing it by means of high concentrations of alcohol, or by adjustment of the iso-electric point. Whether it is really a protein or not, it is significant that all the methods now used for its purification are based on reactions that are characteristic of colloids: precipitation of the iso-electric point (Doisy, Somogyi, and Shaffer), or by picric acid followed by the regeneration from the picrate as a hydrochloride (Dudley), or by benzoic acid (Malony) or by half-saturation with ammonium sulphate.

It is highly creditable to those who have been responsible for producing insulin on a large scale for clinical use that they should have succeeded in so short a time in their work.

It may be assumed that insulin is present in all animals, and since structures similar to the islets of Langerhans have not been described in the invertebrates, it is likely that in them its site of production is delegated to other structures. What these may be in the more highly developed invertebrates is as yet undetermined, but it is of interest that Collip, shortly after isolating insulin from mammalian pancreas, prepared it from clams, and suggested that it must be present wherever glycogen is found. Later he prepared a substance like it from yeast, thus confirming

*These extracts have an unusually marked effect in causing violent convulsions.

Winter and Smith. The insulin prepared from these sources appears to differ from that prepared from pancreas, in that its action in lowering the blood sugar is delayed, sometimes for a day or so, which is also the case with an insulin-like substance prepared by Collip from various vegetable sources, and styled by him, in recognition of these differences, "glucokinin." Best and Scott have also succeeded in preparing insulin, or insulin-like substances, from various other sources. It would appear, therefore, that the distribution of hormones capable of accelerating the disappearance of glucose from the blood is widespread, not only in the animal kingdom but in the vegetable as well; it is probable, however, that these do not all have the same physiological action. In the investigation of this we must bear in mind that many substances have been known for long to be capable of lowering the blood sugar—for example, peptone, hydrazin, certain mineral salts, phloridzin, etc. All of these also cause glycogen to disappear from the liver, and indeed certain of them cause structural changes in this organ. Although it would certainly be desirable to have substances like glucokinin having a more prolonged action than insulin in depressing the blood sugar, we must exercise some caution in recommending them for clinical use until it is certain that they have no deleterious effects on the liver. It is possible also that these substances merely stimulate the secretion of insulin from the pancreas of the animal into which they are injected, or serve as precursors for its production. If such be the case, then they can have little value in diabetes.

I have endeavoured in this review to adhere strictly to ascertained facts, and have refrained from venturing to speculate with regard to the numerous problems in metabolism, both of animals and plants, for the investigation of which insulin may prove a useful instrument. If I have succeeded in giving a bird's-eye view, as it were, of the results that have been obtained, I shall consider that my efforts have not been in vain, and I shall feel repaid if, as an outcome, others join us in the work on insulin.

REFERENCE.

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THE RELATION OF FAULTY NUTRITION TO THE DEVELOPMENT OF THE EPITHELIOMA CONTAGIOSUM OF FOWLS.

(With Special Plate.)

BY

ROBERT McCARRISON, M.D., D.Sc., F.R.C.P.,

LIEUT.-COLONEL, INDIAN MEDICAL SERVICE,

IN CHARGE OF THE DEFICIENCY DISEASES INQUIRY, INDIAN RESEARCH FUND ASSOCIATION; PASTEUR INSTITUTE, COONOOR.

EPITHELIOMA CONTAGIOSUM (avian variola; fowl-pox; chicken-pox; epitheliosis; pigeon-pox; canker) is a disease of birds which has been described as follows:

> It is characterized by "the appearance of wart-like nodules, varying in size to that of a pea, or slightly larger, on those parts of the skin of the head where feathers are few or absent, such as the nostrils, openings of the ears, the comb, wattles, and the eyelids, the last named being one of the most common sites. The nodules are encapsuled, firm in consistence, with a caseous centre, and usually remain discrete, but a number situated closely together form a mulberry-like mass. In some cases the contents resemble fatty tissue, except for being more vascular; in others they are warty and contain flakes of coagulated material very much like small clots of milk. Lesions are also found on the buccal mucous membrane, the affected parts of which become covered with thick whitish-yellow exudate, in appearance resembling that of diphtheritic false membrane."[1]
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> "Marx and Sticker, in 1902, demonstrated that the disease was due to a virus which was capable of passing through a Berkefeld filter, and their results were confirmed by Juliusberg and Hertzog. Burnet, however, obtained very varying results in his filtration experiments. He found that the virus was frequently arrested by the Berkefeld filter, although the infective material had been largely diluted with water. It has not been possible to cultivate the virus artificially, and its nature remains a matter for further investigation. It exists in the blood, internal organs, and in the fluids expressed from the lesions, and is possessed of considerable resistance to the action of heat* and antiseptics. The disease can be transmitted by rubbing juice from the lesions into an area of skin from which the feathers have been removed, or which has been lightly scarified, and the lesions then produced are confined to the part inoculated. According to Burnet, it can also be transmitted by intravenous inoculation and by feeding, and the lesions develop at the predilection seats of the disease."[1]
>
> "The microscopic examination of the epithelioma of the skin shows, according to Polowinkin, the epithelial layers thickened and the epithelial papillae elongated inward; in the papillary layer the vessels are dilated and, like those of the subcutis, surrounded by migrating leucocytes; in addition there are small haemorrhages into the tissue of the papillary layer. Cell-inclusions are found in the swollen epithelium, similar to Guarnieri's pox-bodies (Loewenthal, Burnet). In a general way the characteristic features of the efflorescences are composed of a more or less pronounced hyperplasia and proliferation of the cell elements of the skin, which sooner or later succumb to degeneration. This is associated with the extension of the process to the external skin and there follows a condition which, according to Reischauer, is similar to true pox; the difference lies mainly in the fact that in bird-pox the more chronic character of the disease causes the nodular and tumour formation to predominate."[3]

My purpose here is to record the occurrence of epithelioma contagiosum in pigeons under conditions which indicate that nutritional factors may play an important part in its development. The observations have another and a more general interest, inasmuch as they tend to show that a certain state of faulty nutrition, and of deranged metabolism, favours the entry into the body and the activity of an invisible virus possessing the specific property of inducing epithelial new growth.

Experiment.

Polyneuritis columbarum was produced in a number of pigeons by exclusive feeding on washed milled rice. Twelve of them were "cured" at the height of the disease by artificial feeding with green *mung dal*. Within forty-eight hours of the disappearance of polyneuritic symptoms they were placed in an open-air pen with sixty healthy stock birds, and had access to the mixture of grains found to be most suitable, in this climate and at this altitude, as a stock food for pigeons. It consists of one part of green *mung dal*, one part of *ragi*, and four parts of *cholum*. Thus, the birds, after the cure of the polyneuritis, received a food containing a sufficiency of vitamins and other essentials for their maintenance in perfect health. Owing to their poorer nutrition when put into the stock-pen, they were less able to protect themselves against attack by their more lusty companions. The lessened ability to escape injury and to recover from it is an important effect of faulty food on the animal organism, and in this instance abrasions about the head—the most frequent seat of injury—appear to have favoured the entry of the virus of epithelioma contagiosum. In general, then, the twelve "cured" birds were more subject to injury than their fellows. Nevertheless, as weeks passed they appeared to prosper; their plumage improved and their body weight rose. Six weeks to three months after they were put into the stock-pen seven out of the twelve developed epithelioma contagiosum (Fig. 1), while their sixty healthy well fed companions remained free from it.

The growths occurred about the angles of the mouth, on the eyelid, the nostril, in the neighbourhood of the ear, and in the floor of the mouth beneath the buccal mucous membrane (Fig. 1). Their histological characters are shown in the photomicrographs (Figs. 3 to 6). The epithelial downgrowths stimulated in appearance those seen in such a condition as carcinoma of the penis in man. The epithelial new growth was infiltrative to a limited extent, had local destructive properties, and its cells tended to undergo rapid degeneration.

The nodules were emulsified, and the emulsion was rubbed into lightly scarified surfaces at the angle of the mouth of six healthy and well-fed pigeons. In two of these diphtheritic false membranes developed, and one of them died from the extension of the false membrane backwards, resulting in interference with swallowing and in involvement of the air passages; the second recovered. The other four were unaffected. In none did the inoculation of the emulsified nodules cause infiltrative new growth of epithelium. It would seem, therefore, that these well nourished birds were resistant to the influence of the growth-inducing virus, since those affected by its inoculation exhibited only superficial lesions. It appears likely that the virulence of the virus was not great; it was great enough to cause typical lesions in birds whose nutrition was faulty, but not so great as to be capable of causing infiltrative lesions in healthy, well-nourished birds.

*In this respect resembling the growth-promoting substance evolved during the process of autolysis of tissue cells.[2]

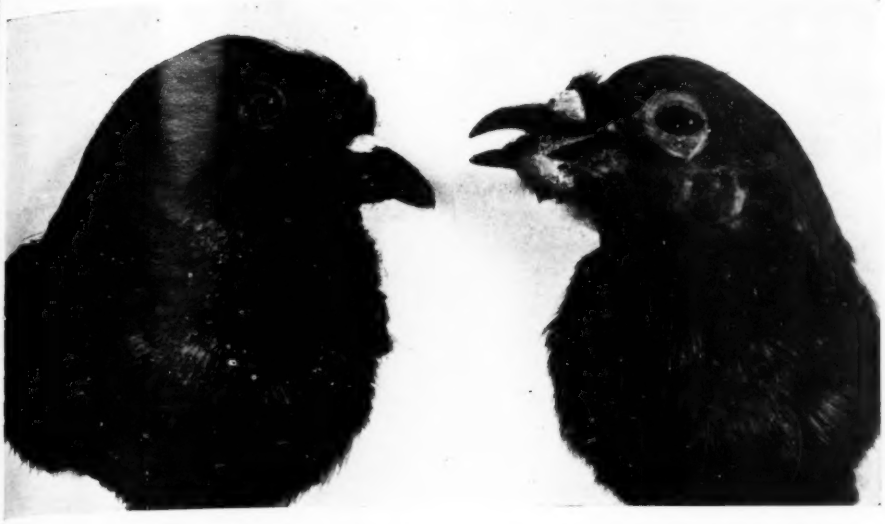

FIG. 1.—Epithelioma contagiosum in pigeon (right-hand figure); normal control bird (left-hand figure). Section of epithelioma from this case is shown in Fig. 3.

FIG. 2.—Epithelioma contagiosum involving the floor of the mouth.

FIG. 3.—Section of nodule showing infiltrative new growth of epithelium; early stage before degeneration of cells has begun.

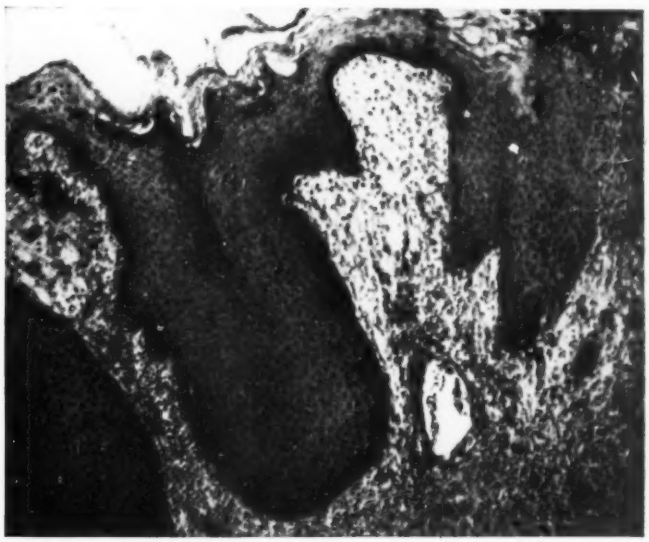

FIG. 4.—Advancing edge of growth invading floor of mouth, showing epithelial downgrowths and swollen epithelium containing cell inclusions.

FIG. 5.—Low-power photomicrograph of epithelial growth advancing from buccal mucous membrane into the tissues forming the floor of the mouth.

FIG. 6.—Section of nodule from the nostril. Low-power magnification showing the characteristic epithelial downgrowths and islets of epithelium: a number of the latter show degenerative change in their centres.

FIG. 3.—Fracture of first lumbar vertebra.

FIG. 2.—Extradural tumour.

FIG. 1.—Intradural tumour.

The development of epithelioma contagiosum in seven out of twelve birds which had been subjected to previous vitamin depletion, at a time when sixty others not so depleted escaped the malady, indicates that this depletion combined with other food faults was responsible for the occurrence of the disease. Before they were put into the stock-pen the birds had been fed on washed milled rice to a point at which typical polyneuritis columbarum developed. Now while the polyneuritic symptoms are directly attributable to the absence of vitamin B from this dietary, the disorder of metabolism and the changes in the body tissues are the consequence not only of this want but of the excess of starch and the deficiency of protein, fats, and inorganic salts associated with it.[4]

Outside the laboratory pure and complete avitaminosis must be extremely rare, but partial avitaminosis is common in human dietaries, and is always, or almost always, associated with other deficiencies or excesses or both. Indeed, the permutations and combinations of food deficiencies with food excesses are numerous, and in practice it may be expected that the disturbances of metabolism, and the symptoms resulting from them, will vary according to the particular combination of food faults in the diet.

The belief is now common that vitamin deficiency, so far from favouring tumour growth, is actually unfavourable to it. But in appraising the significance of any such effect of vitamin deficiency not only must the degree of avitaminosis be considered, but also the other food faults by which it is accompanied. If the avitaminosis be complete, growth of any tissue will become impossible; whereas if it be incomplete it may favour the operation of a growth-inducing factor. While, therefore, complete avitaminosis, or extreme degrees of it, protracted over long periods, may be unfavourable to the growth of tumours in laboratory animals, the case may be different in practice, where avitaminosis is rarely, if ever, complete, but is often of sufficient degree to play an important part in association with other food faults in bringing about disordered states of metabolism not necessarily incompatible with life, but incompatible with perfect health.

The condition of the "cured" birds at the time of their entry into the stock-pen had been produced rapidly, but it results as surely, although more slowly, when the vitamin deficiency is less drastic. In a high percentage of the birds the function of the gastro-intestinal tract was greatly impaired.[4] The restoration of this function takes time and is not coincident with the cure of the polyneuritic symptoms. In all the birds the liver had lost approximately one-third of its total cells, and approximately one-third of its total content of nucleic acid. In all the gonads were atrophic, involving a deficient supply to the body of their internal secretions. The function of the adrenal glands, which is intimately related to the metabolic processes of the animal organism, was deranged in all[4]; and although in a proportion of polyneuritic birds the provision of suitable vitamins restored in part this function, yet restoration had not occurred in the birds affected by the virus of epithelioma contagiosum. Further, the vitamin depletion involved a loss of body lipoids and changes in the reaction of the body fluids and tissues. Though the polyneuritic symptoms are the most obvious evidence of vitamin depletion, they are not the most important; for while they usually disappear rapidly with the provision of the missing vitamins, recovery from the less obvious metabolic disturbances and pathological changes is slower. After the cure of the polyneuritic symptoms the birds had access, for periods of from six weeks to three months, to a food mixture that sufficed for the maintenance of perfect health in previously healthy birds; but although they appeared to eat well of the food provided, yet it did not suffice, within the period, for the complete restoration to health of birds previously depleted of vitamins; it did not protect them against the action of the virus which causes infiltrative new growth of epithelium. Nor did it suffice, as appeared on *post-mortem* examination, to restore the deranged function of endocrine organs. In birds which developed epithelioma contagiosum it was found that the adrenal enlargement consequent on avitaminosis had persisted and had indeed in most cases become exaggerated.

The combined weight of both glands ranged between 40 and 110 mg.; in two cases it reached 100 and 110 mg. respectively. Their average weight was 75 mg., or 375 mg. per kilogram of body weight; the normal figures being 26 and 95 mg. respectively. In one male the testicles weighed only 10 mg.; in another 30 mg., and in a third 320 mg.; the normal average weight is 1,355 mg.

The adrenal hypertrophy and the atrophy of the gonads was evidence that the disordered state of metabolism, induced by previous vitamin depletion, had not been recovered from. It seems likely, indeed, that the derangement of endocrine function induced by avitaminosis was a factor of importance in the development of epithelioma contagiosum in these cases.

Looking at the matter from the point of view of the combination of factors concerned in the development of the epithelial new growths in this particular instance, we find this combination to have been:

1. Lessened bodily vigour; which favoured the occurrence of injury or abrasion of exposed parts, and the entry into the body of a growth-inducing virus.
2. The fortuitous presence in the pigeon-pen of an invisible virus possessing the property of inducing infiltrative new growth of epithelium.
3. An abnormal state of metabolism, with disorder of endocrine function, favourable both to the entry of this virus into the body and to its activity therein.

Apart from the fact that deranged metabolism, induced by faulty food, appears to favour the development of epithelioma contagiosum in birds, this combination of causal factors deserves consideration from a more general point of view. Given the intervention of a factor possessing growth-inducing properties it is possible to suppose that faulty food may induce in the animal organism such a state of deranged metabolism that this factor may become operative and epithelioma may arise. In the experiment here recorded the epithelial growths were more or less benign, but the significant fact is that the combination of causes which existed favoured the development of epithelial new growth.

It is not suggested that all these conditions must invariably be satisfied before epithelioma contagiosum can arise; it is possible that the virulence of the virus may vary, and may sometimes be so great as to cause epithelial growths even in birds whose nutrition is perfect. Since disordered states of metabolism consequent on vitamin depletion and the food faults associated with it are favourable to the operation of this invisible virus, they are probably also favourable to the operation of others possessing like properties. The virus in the experiment here recorded must have been introduced into the body, and it is possible that in nature there are others possessing the property of inducing new growth whether of epithelium or of other tissue cells. In this connexion I am reminded of the association of carcinoma and of sarcoma in rats with infection by certain nematode and cestode worms—such, for instance, as *Spiroptera neoplastica* (Fibiger) with carcinoma of the stomach; and *Taenia crassicollis* (Rohdenburg and Bullock) with sarcoma of the liver. It is conceivable that these parasites produce poisons possessing inherent growth-inducing properties. If this were so vitamin depletion might well be a "limiting factor"* as important in the development of these growths in rats as it is in the development of epithelioma contagiosum in pigeons.

It is indeed conceivable that substances possessing this property may be evolved from the tissue cells themselves under conditions of slow disturbance of nutrition, in a manner comparable to the evolution of such during the process of autolysis of cells.[2] Many of the effects of avitaminosis resemble, as shown by Cramer and his co-workers, those produced by exposure to x rays; the development of epithelioma in man or of sarcoma in rats following injury by x rays may be related to disturbance of the nutrition of cells induced by these rays. If it could be shown that a growth-promoting factor is evolved in tissues

* This term is used in its agricultural sense: a lacking condition, the insufficiency of which prevents proper growth.

over-exposed to *x* rays, then *x*-ray burns would provide a combination of factors favourable to the development of epithelioma analogous to that which caused the development of epithelioma contagiosum in pigeons—injury, disturbed nutrition of cells, and the possible presence of a conjecturable growth-promoting factor.

Having regard to the profound degenerative changes which are produced in the gastro-intestinal tract by faulty food deficient in vitamins,[4] and to the ease with which, in these circumstances, harmful substances may find their way into it, or may be formed in its contents, it is possible to suppose that among these substances there may, at times, be some possessing growth-inducing properties. In this connexion attention may be drawn to the occurrence of a carcinoma of the pylorus in an early stage in one of my monkeys fed on a diet of autoclaved food, butter, and onion.[4] Although I cannot affirm that this carcinoma had actually developed within the period of the experiment, yet the observation is to be borne in mind in connexion with the considerations raised in this paper.

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RADIOGRAPHIC LOCALIZATION OF SPINAL LESIONS BY SICARD'S METHOD.*

(With Special Plate.)

BY

PERCY SARGENT, C.M.G., D.S.O., F.R.C.S.,

SURGEON TO ST. THOMAS'S HOSPITAL, AND TO THE NATIONAL HOSPITAL FOR THE PARALYSED AND EPILEPTIC.

DURING a recent visit to Paris Professor Sicard kindly demonstrated to me his method of localizing certain spinal lesions by radiography after injecting an opaque fluid into the spinal theca. It provides us with a new means of diagnosis of great value.

Briefly, Professor Sicard's method is as follows. A small quantity, between 1 and 2 c.cm., of lipiodol is injected into the spinal theca through a suboccipital puncture, the patient being in a sitting posture. Lipiodol is a heavy oily fluid consisting of "huile d'oeillette" containing 40 per cent. of iodine, and is remarkably opaque to the *x* rays. The lipiodol sinks slowly downwards and is arrested at any point of occlusion of the spinal theca, so that the upper limit of a tumour, for instance, can be accurately demonstrated by *x*-ray examination. Similarly the lower limit of such a tumour can be shown by injecting the lipiodol through a lumbar puncture, and taking a radiogram with the patient in the head-down position. The three cases in which I have employed this method are as follows:

CASE I (*Under the care of Dr. M. A. Cassidy*).

An intrathecal neurofibroma compressing the cord at the level of the ninth thoracic segment. The curved lower border of the shadow defines clearly the rounded upper surface of the tumour (Fig. 1). The two small shadows situated lateral to the main mass mark the position of a posterior root ganglion. The tumour was removed, and the patient made a rapid and uninterrupted recovery.

CASE II (*Under the care of Drs. H. G. Turney and A. E. Russell*).

An extrathecal endothelioma at the level of the eighth thoracic segment. The radiogram (Fig. 2) showed the lipiodol to have been completely arrested at the level of the body of the sixth thoracic vertebra. In this case the neurological signs were such as to render it doubtful whether the case was one of spinal compression at all, whilst at the same time the exact segmental level was difficult to define. The radiographic examination immediately and almost dramatically settled both these questions. Laminectomy was performed and the tumour was removed.

CASE III.

Fracture-dislocation at the level of the first lumbar vertebra. Here the radiogram (Fig. 3) shows the narrowing of the spinal canal and the upper limit of thecal occlusion. It also shows small droplets of lipiodol arrested at various points, probably demonstrating the presence of arachnoidal adhesions.

Even from these few cases the value of Sicard's method is obvious. Not only can it be employed to ascertain whether or not a block exists in the spinal theca, but it shows the exact position of the lesion with relation to the bones. From the operative standpoint the localization is more accurate than that which can be arrived at by neurological examination. Neurological signs may enable the segmental level to be accurately determined, but the exact position of any given spinal segment with relation to the bones is by no means easy to ascertain. Consequently a radiographic demonstration of the relation of the lesion to the vertebrae is of great value, and enables a tumour to be exposed by the removal of perhaps only three laminal arches. If, the upper limit of a tumour having been defined, a second examination is made by taking a radiogram with the patient placed head downwards after injecting lipiodol through a lumbar puncture, the lower limit of the tumour can also be demonstrated. This is a point which cannot be ascertained by neurological examination, but it is a matter of considerable importance to the surgeon, since tumours extending over many segments are sometimes encountered.

I am indebted to Sir Archibald Reid and Dr. Fildes for the excellent radiograms from the radiological department of St. Thomas's Hospital.

*A paper communicated to the Section of Surgery at the Annual Meeting of the British Medical Association held at Portsmouth.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

A LONG PAROXYSM OF AURICULAR FIBRILLATION.

MRS. M., now aged 74, was seized on November 15th, 1919, with right hemiplegia and aphasia. The pulse was hard, regular, and slow. Early on November 17th she became faint with cold clammy skin, and later in the day it was found that auricular fibrillation had set in, the pulse rate averaging 130. On November 24th this attack ceased, and the pulse was regular at 64. On December 3rd fibrillation once more appeared, and its onset was apparently associated with the same symptoms of heart failure as before. From this time onward till July, 1921, a period of eighteen months, she was seen at first weekly and later about once a month, and during the whole of this period the pulse remained quick, and wholly irregular. At my July visit the pulse was found to be regular at 60 a minute. Since that date she has had three paroxysms of fibrillation, each of a few days' duration, and each time she has become collapsed and somnolent at the onset of the attack. When the heart is regular, the rate is slow (50 to 60), and the symptoms of heart failure at the commencement of fibrillation are doubtless dependent on the great increase of rate. As she is constantly in bed she apparently becomes inured after a time to the defective circulation. The polygraph curve during an attack shows a wholly irregular pulse without accurate spacing of the beats, such as is found in the irregular pulse of auricular flutter.

It is well known that a paroxysm of auricular fibrillation may continue for some months and then cease (Mackenzie), but it is probably very unusual for an attack to last as long as a year and a half. It seems fair to assume that during the whole of this period fibrillation was present even though the patient was seen only once a month during the latter part of the period. The onset of tachycardia is always associated with the prominent symptoms of heart failure, and these would almost certainly have been observed and reported to me by her daughter had there been any return of the normal rhythm followed by a fresh paroxysm.

Hull. E. E. LASLETT, M.D.

THE SECTIONS.

BRIEF SUMMARY OF PROCEEDINGS.

ARRANGEMENTS have been made to publish full reports of the discussions in the Sections of the Annual Meeting at Portsmouth during the next few months. Meanwhile, the brief notes printed below, and those that will appear next week, should enable members who were not present to gain a general view of the proceedings. Any errors to which attention may be drawn will be corrected in the full reports.

SECTION OF MEDICINE.

Wednesday, July 25th, 1923.

DIABETES AND INSULIN.

THE President, Sir Thomas Horder, in opening the very largely attended discussion on diabetes mellitus, said that it would naturally turn into a discussion on insulin. The public had come to regard the problem of the treatment of diabetes as already solved by the introduction of insulin; but that was not so. Diabetes might be the result of several biochemical disturbances, and insulin would help to mark off certain different types seen in practice. It was already known that some cases benefited much less than others, and that some, again, were not benefited at all. This position must be made quite clear. It was not yet established whether the pancreas would recover; if the disease was necessarily progressive the outlook was still very bad for young diabetics. At what level should the blood sugar be maintained to rest the pancreas most thoroughly, and are blood sugar estimations to be continued as a necessity in treatment? Were the rapid methods in use accurate for estimating the blood sugar, and could they be carried out by the general practitioner? Could the dosage of insulin be controlled by examination of the urine only? Would it be possible to give the active principle of insulin by the mouth by suitable preparation? The President drew attention to the abuse of insulin by the greedy patient and in cases of renal glycosuria. The discussion of insulin would leave no time to touch on the relation of sepsis to diabetes, nor on the ultimate causation of pancreatic diabetes. Insulin was the greatest contribution yet made to the study of diabetes, and a hearty welcome was extended to Dr. Banting of Toronto.

Dr. F. G. Banting said that Mr. Best and he and their associates thanked the profession for the way in which it had received the result of their experiments. He outlined the story of his research, saying that many attempts had been made to prepare extracts of the pancreas and use the active principles. Following ligation of the pancreatic ducts, dogs did not become diabetic and the acinous cells alone degenerated. Ten weeks after ligature the degenerate pancreas was removed and extracted with saline. In a depancreatized dog the blood sugar rapidly rose, reaching 0.4 per cent. in a few days; the wound broke down, the animal weakened; hunger, thirst, and rapid loss of flesh followed. On injecting the extract thus prepared, the blood sugar diminished, the animal gained strength and lost its ravenous appetite. But the amount of pancreas so obtained was very small and the method was not satisfactory for preparing the extract. The injection of secretin over a long period to exhaust the acinous cells and destroy the trypsin was not reliable. Up to the fourth month no trypsin granules were found in the acinous cells of the pancreas of a foetal calf, and an extract of this material was found very potent in lowering the blood sugar; the second dog was killed by an overdose and died with symptoms now recognized as those of hypoglycaemia. The problem was to extract the whole pancreas by some chemical agent which would destroy the proteolytic ferments without touching insulin. Alcohol in certain percentages was tried. Dr. Cobb succeeded in fractionating out the active principle in 82 per cent. alcohol. Since then rapid progress had been made, and the product now contained no protein, was non-irritating, and more easily standardized. Insulin in proper doses in the laboratory reduced the blood sugar of a diabetic dog to normal or less, and rendered the urine sugar-free; by it a depancreatized dog could be kept alive for thrice the usual period. The liver of a depancreatized dog did not contain more than 0.5 per cent. of glycogen, but after insulin and glucose as much as 18 per cent. of glycogen might be found; therefore insulin enabled the dog to store glycogen. Adequate doses of insulin would control all forms of hyperglycaemia. In a rabbit the effect of an overdose of insulin caused a fall in the blood sugar, the animal became hungry, then dull, and had intermittent convulsions and periods of unconsciousness; if given glucose the symptoms were relieved or prevented. The clinical work at Toronto had been carried out by Professor Duncan Graham, Drs. Campbell, Fletcher, and Gilchrist. In the management of a diabetic the following was the routine adopted. If the condition was at all severe the patient was admitted to hospital for at least three weeks for training and the working out of the sugar tolerance. A careful history was taken with special reference to heredity and infection; for twenty-four hours the patient was kept on his ordinary diet to judge the severity of the disease. He was then placed on his basal requirement diet; if fully grown, three-quarters of a gram of protein per kilo of body weight per diem was allowed, but more protein was given if the patient was not fully grown, and the remaining calories were made up of carbohydrate and fat in the proportion of 1 to 1.3 (modified Woodyat diet). He was kept on this from three to four days; if a mild case, he would become sugar-free; if severe, the sugar output became more constant. If the patient was sugar-free the carbohydrate was raised; if he could take 500 calories over and above the basal requirement, insulin was not given. The output of sugar was of value in estimating the initial dose of insulin. In severe cases one unit of insulin metabolized 2 to 2.5 grams of carbohydrate, though it varied in different persons and cases; where infection was present also the amount was less. In mild cases one unit might metabolize 5 or 6 grams. The initial dose should not render the patient sugar-free, as there was not enough glycogen in the liver to act as a buffer. A dose of 5 units to begin with was usual unless the patient was comatose; it should be given half an hour to an hour before meals and never more than once a day. It was advisable to keep the patient sugar-free, because when sugar-free the pancreas tended to produce insulin. There was evidence of a development of an increasing tolerance in many cases, but this was not so marked in those whose glycosuria was adequately controlled by dieting.

Dr. P. J. Cammidge (London), after expressing his admiration of Dr. Banting's work, said that he had been engaged for the last ten or fifteen years in trying to find the cause of diabetes. All cases were not due to disease of the pancreas. The pancreas acted as a brake on carbohydrate metabolism and regulated the storage of glycogen in the liver. There were three main types of diabetes—due respectively to pancreatic deficiency, to inability to store glycogen in the liver, and to factors which stimulated an increased carbohydrate metabolism. In 80 per cent. of cases there was a pancreatic element, but only 45 per cent. were entirely pancreatic. It was in the pancreatic group that insulin was of the greatest advantage. Dr. George Graham (London) said that sugar tolerance could undoubtedly be recovered under treatment with insulin to a certain extent, but the main aim and object of treatment was to make certain that the blood sugar was normal in the morning before the dose of insulin was given, and no carbohydrate beyond that present in vegetables should be added till the morning blood sugar had been normal for three or four weeks. If the blood sugar was 0.2 or 0.15 the islets cells were being overworked. In order to produce this a varying dose of insulin would be required in different individuals; in some 10 to 15 units a day sufficed, but in others 30 to 50 units, even twice a day, might be necessary; no two patients responded in the same way. He had treated three cases of coma; two recovered and one died. The fatal case had an abscess in the parotid, and it was of the utmost importance to hunt for sepsis in every case of coma. Twenty to 30 units should be given subcutaneously at once; sugar need not be given if

the patient had much glycosuria; but if very bad 50 grams of sugar should be given and 60 units of insulin; but as much as 140 units might be required in the twenty-four hours. If the patient had glycosuria, blood sugar estimation was not essential; but if sugar-free, an occasional estimation was necessary for the control of the dose. It was possible to preserve blood for sugar estimation by adding one drop of formalin to 5 c.cm. oxalated blood.

Dr. J. A. Nixon (Bristol) said that this was a very memorable discussion; he spoke of insulin perhaps prematurely, but certainly enthusiastically. He would like to know if a patient was any better for being sugar-free when he had a high blood sugar; mere glycosuria was not a sufficient guide in treating patients. Was such a patient safe when gaining in weight and in sense of well-being? Provided the sugar threshold was known, if glycosuria occurred with a normal blood sugar it might be said that glycosuria was the safest point. But were patients with hyperglycaemia safe to send out of hospital for treatment? Dr. Nixon recounted the case of a patient who had had 20 units of insulin daily for three days, and then developed temporary aphasia in which repetition of syllables occurred; he was given glucose, and talked moderately well in two days. He had had angina pectoris before this. Was this a symptom of hypoglycaemia? Another patient complained of tingling in the lower limbs and swelling in the feet. Was this due to hypoglycaemia? He considered Woodyat's formula of the greatest value in adjusting the minimal adequate diet. Should insulin be given to a true diabetic with a high sugar tolerance? Dr. John Rennie (Glasgow) referred to the treatment of ten cases, in all of which an attempt was made to get them sugar-free by dieting before commencing treatment with insulin. As a rule the chronic cases with a low tolerance did well. With sugar and acetone present in the urine blood sugar estimations were not necessary, and in cases showing much acidosis the urinary sugar might be neglected. On a constant carbohydrate intake the insulin might perhaps be reduced and the tolerance partly restored. He had been unable to find any experimental evidence that insulin was absorbed through the skin. Dr. E. P. Poulton (London) had tried to determine if there was any increase of sugar tolerance in mild cases—that is, those which became sugar-free on diet restrictions after prolonged treatment with insulin; the rise of blood sugar was estimated after giving a dose of 25 grams of sugar, and the experiment repeated after a period of treatment. The diet yielded about 40 calories per kilo, and the patients were walking about. After 60 units a day for thirty days there was no evidence of improved tolerance in one case, though the patient gained in weight. In a second case there was some distinct improvement; in a third, perhaps a slight improvement; in a fourth case, after eighteen days' treatment, there was a slight but definite improvement.

Dr. O. Leyton (London) divided cases into two groups—those of recent onset, and those of longer duration in which the pancreas had been saved as far as possible by dieting. In the majority of cases if the patient was given a general anaesthetic—whether chloroform, ether, or nitrous oxide—the sugar tolerance fell. Insulin should be given to make the blood sugar below rather than above normal. In recent cases an attempt should be made to keep it below 0.09 or 0.07 per cent. He detailed certain symptoms of hypoglycaemia. In one instance a boy of 5, who was suffering from Hirschsprung's disease as well as diabetes, suddenly became comatose, and a man over 40 had an epileptiform seizure preceded by dizziness, sweating, tremors, and slurred speech. Dr. A. P. Thomson (Birmingham) discussed the treatment of thirty cases, two of which had definitely recovered tolerance. It was impossible to treat a fool with insulin. If the patient would not stand dieting insulin was of no use. Blood sugar estimations were essential when giving large doses of insulin, as in cases of coma, but at other times treatment could well be carried on without. He related the case of a young man aged 21, who, though nearly in coma, did well upon insulin, but suddenly developed bilateral cataract while sugar-free; he mentioned also two cases of haematuria following large doses. Toxic symptoms might occur without hypoglycaemia and be relieved by 0.5 c.cm. pituitrin. Dr. F. A. Roper (Exeter) considered it important that a patient should be under strict observation before insulin treatment was begun. He described a severe case of diabetes in a man aged 56 in whom the onset coincided with an attack of dysentery, and who now had albuminuria also and a strongly positive Rothera reaction; his general condition contraindicated prolonged alimentary rest; a comparatively small dose of insulin (10 units thrice a day) rendered him unconscious, but he made a complete recovery after a dose of glucose intravenously. Dr. Waters (I.M.S.) asked if the potency of insulin was affected in any way by the temperature at which it was stored; and Dr. Clarke Begg (Swansea) asked what instructions should be given to patients on leaving hospital. Should the aim be to get them sugar-free, or should they have a small degree of glycosuria?

Dr. Banting, who replied at the request of the President, said that the cause of the deficiency of the islets was not known. Continued treatment was necessary in severe cases, and the patients could be trained to give injections to themselves. Larger doses were always necessary at the outset of treatment; when two doses a day were given the larger should be in the morning; the ideal was to balance the amount administered to correct the deficiency. It was easier to treat a long-standing elderly diabetic than a young and early case. An attempt should be made to maintain the blood sugar at its normal level; raised blood sugar stimulated the pancreas. On the patient's discharge from hospital a detailed letter was sent to his family physician; but by this time the patient was thoroughly acquainted with the routine. Of the symptoms of hypoglycaemia the most frequent were a feeling of uneasiness, of impending disaster, trembling; in children pallor, increased pulse frequency, and sweating. These symptoms were succeeded by incoherent speech, hunger, sleepiness, and coma. The rate of fall of blood sugar was influential in determining the onset of symptoms, which might not occur till 0.05 per cent. was reached, and as low a figure as 0.032 per cent. had been recorded. Adrenaline (mx to xv) would usually render a comatose patient conscious, owing to its rapid action in turning out glycogen from the liver; when conscious the patient should be given 10 to 20 grams of glucose by the mouth. Insulin, if kept at room temperature, did not lose its potency in six months, but Dr. Banting had no knowledge of the effect of high temperatures. There was no reason why a diabetic should not be treated as well by the general practitioner as by the specialist.

SECTION OF SURGERY.

Wednesday, July 25th.

THE discussion on the treatment of obstruction of the colon at the first session of the Section of Surgery attracted a good audience. The President of the Section, Sir Henry Gray, in introducing Mr. Arthur Burgess of Manchester, said that he was grateful for the compliment paid himself in being elected President of the Section, as it was probable that this would be the last occasion on which he as a Britisher would be able to attend. Mr. Burgess indicated that his intention was to deal with obstruction of the colon by gross mechanical obstacles. He discussed the chances of obstruction of the colon in relation to cause, and pointed out that malignant disease was responsible for acute obstruction in the proportion of 9 to 1; in regard to the location on one side of the body or the other, the proportion of cases on the left compared with the right was as 6.5 to 1. He approached the discussion of the appropriate treatment of acute obstruction of the colon mainly from the clinical standpoint, and considered the cases as they presented themselves prior to the operation under three groups. In the first came those in which it could not be ascertained whether the obstructions were in the ileum or in the colon; the second group included cases where the obstruction was of the colon, but its precise situation therein was not known; the third group included cases where the site of obstruction in the colon could be definitely ascertained. With increasing experience the number in

the first group would diminish; the essential requirement was a careful inquiry into the previous medical history. The keynote to the diagnosis was the condition of the caecum; if this were visibly distended, or if it were definitely felt to harden and soften alternately under the fingers, then the obstruction was distal. In the most desperate cases of this group no attempt should be made to find the obstruction; but under local anaesthesia the caecum should be exposed through a right gridiron incision and "blind" caecostomy performed. By this means obstruction was relieved and the patient was rid quickly of the intense toxæmia, so that in a few days the operation, having for its object a search for the cause of the obstruction, could be proceeded with. He deprecated the performance of an exploratory laparotomy except in cases where very obviously the patient would not be likely to suffer. The experience in the Manchester Royal Infirmary over a period of years was that the percentage of mortality was nearly 30. He advocated strongly the routine performance of caecostomy, even in cases where secondary operations were performed; he felt convinced that those high figures could be very materially reduced. In cases where it was possible to make a more or less leisurely examination, exploratory laparotomy was likely to be the operation of choice. The discussion was taken part in by Mr. Seymour Barling (Birmingham), Mr. Mitchell (Belfast), Mr. Carson (London), Mr. P. Lockhart-Mummery (London), Mr. Charles Pannett (London), Mr. Geary Grant (Cardiff), Mr. C. P. Childe (Portsmouth), Dr. Mothersole, and Mr. Mamourian (Ashton-under-Lyne). The general tendency of the discussion was altogether in support of Mr. Burgess's argument, but the hope was expressed that cases might in the future be received much earlier by the surgeon, as there must be many patients who suffered from slight colicky pains and diarrhoea of persistent nature, which on investigation proved to be the preliminary signs of a colonic cancer. If these early evidences were supported by x-ray and other examination the likelihood of acute obstruction occurring would be lessened.

After a short interval the President vacated the chair, and Mr. Patrick (Glasgow) called upon Mr. H. J. Paterson (London) to read his paper on the question as to the improvement or otherwise in the results of operative treatment of malignant disease during the past twenty years. Mr. Paterson suggested that improvement was not so great in results as in technique, and he wondered whether technique had not been carried beyond the pathological necessities of the case. He regarded it as questionable whether it might not be better to remove the infected glands at a later stage, on the ground that these glands were actually the first barrier of defence, and that it was unwise to remove that barrier at the primary operation. There were, he thought, good grounds for hoping for better results in the future, but these better results would follow rather upon earlier diagnosis than upon improved technique. Mr. Childe expressed the opinion that there was a place for educating all people who came in contact with the sick poor—nurses, clergymen, and others—in the early signs of cancer; propaganda along these lines, which had for its object the education of the people, had been carried on in Portsmouth. The subject was further discussed by Sir StClair Thomson, who contrasted the ideas of malignant disease of the larynx held by the great masters of throat surgery of a generation ago with those held in the present day, and pointed out that out of 60 cases of his own only 8 had shown recurrence within the first year. Dr. Major Greenwood spoke from the point of view of the statistician, and advocated a better standardization of operation statistics. Dr. Bruce (Toronto) said that in Canada as the direct result of propaganda the public were coming much more readily to consult the surgeons in regard to possible cancerous tumours.

SECTION OF OBSTETRICS AND GYNAECOLOGY.

Wednesday, July 25th.

THE first meeting of this Section was devoted to a discussion of the treatment of acute salpingitis. In calling upon Mr. Aleck Bourne to read the opening paper, the President, Mr. Victor Bonney, said that this subject had been chosen because at present there was no consensus of opinion on the matter and he thought it was highly important that some such consensus should if possible be reached.

In his preliminary remarks Mr. Bourne explained that he was confining his paper to the treatment of those forms of acute suppurative salpingitis which gave rise to the signs and symptoms of pelvic peritonitis. Clinically, such cases consisted essentially in an attack of acute suppurating pelvic peritonitis with a background of genital symptoms due to an acute suppuration of one or both Fallopian tubes. After briefly describing the cardinal signs and symptoms whereby this condition could be recognized, Mr. Bourne proceeded to outline the primary objects to be aimed at in treatment. The first object should be to arrest the acute disease and prevent its extension to the abdominal cavity proper. By efficient treatment it should be possible not only to localize the disease, but to cut short the long-drawn-out course of tubal and pelvic suppuration which nearly always occurred when expectant methods only were adopted. The second object should be to prevent the formation of chronic sequelae in the shape of adhesive pelvic peritonitis, interstitial salpingitis, pyosalpinx, etc. He considered that it was virtually impossible for a suppurative salpingo-peritonitis to resolve unless operated upon. Chronic thickenings, adhesions and cold abscesses were the almost inevitable result producing a state of chronic semi-invalidism with relapses of acute symptoms and, in the case of bilateral infections, certain sterility. The third object should be to enable the affected tube to resolve sufficiently to resume its normal function. Their aim should be not only to prevent chronic ill health, but, if possible, to give back the reasonable hope of conception. Mr. Bourne proceeded to demonstrate with the assistance of slides the essential pathology of acute tubal inflammation, arriving at the following general conclusions: (1) That in spite of a very acute inflammation the tubal epithelium was very resistant in the early stages and only desquamated in patches. (2) That after the acute phase had passed the greater portion of the epithelial surface was intact, but what lesions remained were very likely to develop adhesions. (3) That plical adhesions in the tube might be very extensive, cutting the channel into a number of diverticula which probably continued to harbour infection, and furthermore might predispose to ectopic gestation. The epithelium being so remarkably resistant should be able to function provided that it were relieved of its acute irritation at the earliest possible moment and that the barrier to the entrance of ova set up by the inevitably sealed abdominal ostium was relieved by artificial salpingostomy. As a rule the employment of expectant medical means would result in the acute symptoms passing off and the subsidence of any pelvic inflammatory mass, but the patient would probably be sterile and the slow development of chronic salpingo-oöphoritis or pyosalpinx would only be a matter of time. Something more than that should be accomplished. Mr. Bourne urged strongly that this could only be attained by surgical measures, and claimed that operation should be undertaken at the earliest possible moment. After disposing of the principal objections to operation during the acute stage, Mr. Bourne proceeded to describe in detail the operative measures to be adopted according to the condition found on opening the abdomen. He advised the slitting up of both tubes: if the epithelium were found to be intact the tubes should be left, pelvic drainage being provided for either through the abdominal wound or by the vagina. By these means a check was given to spreading peritonitis and the formation of adhesions, the lumen of the tube was given a chance of resolution without the risk of further permanent changes caused by the continuation of suppuration, and the formation of a pyosalpinx was obviously impossible. If on laying open the tube the mucous membrane was so severely ulcerated and gangrenous as obviously to be beyond the power of functional recovery it should be removed forthwith as a useless organ and probable source of future danger. Mr. Bourne had examined a recent specimen of a tube treated by salpingostomy in a patient who had died of intercurrent pneumonia and found that complete resolution had taken place. He claimed that if the tube were treated early salpingostomy

would give a patient the chance of further childbirth, while if the tube were already too much damaged salpingostomy would prevent permanent ill health. A lively discussion ensued in which the following took part: the President, Dr. Carlton Oldfield (Leeds), Dr. John Campbell (Belfast), Professor R. W. Johnstone (Belfast), Mr. Leonard Phillips (London), Dr. Gilmore Currier (U.S.A.), Mr. Rivett (London), and Mr. Hendry (Glasgow). A communication from Mr. Blair Bell (Liverpool) was read by the President. Mr. Bourne closed the Section's proceedings by a brief reply.

SECTION OF PATHOLOGY.

IT is proposed to publish next week the full report of the first day's proceedings in the Section of Pathology and Bacteriology, when a discussion took place on diseases of the stomach, particularly with reference to modern methods of investigation, opened by Dr. Charles Bolton, F.R.S.

Thursday, July 26th.

Professor H. R. Dean, in his paper on serum reactions, pointed out that the reactions which take place *in vitro* between antigen and antibody are in a sense by-products of other research, the primary object of which was the means by which bacterial disease may be prevented or cured. The discoveries of agglutination, precipitation, and complement deviation were made by men interested in the broad and general principles of immunity, and the valuable practical methods were the outcome but not the primary objects of their discoveries. The remarkable specificity of these reactions was observed during the progress of the earliest work on the serum reactions, but the nature of this specific reaction remained to-day as great a mystery as ever. Professor Dean recalled several examples illustrating the specificity of serum reactions, and mentioned Nuttall's work on the differentiation of the blood serum of nearly allied species of animals by the precipitation reaction, the agglutination reactions of the typhoid-paratyphoid group of bacteria, and the separation of pneumococci and meningococci into groups. As Andrewes's work had shown, serum reactions could be made to demonstrate variations occurring in the individuals comprising the population of a pure bacterial culture. He gave instances in which the serum of a wounded soldier suffering from mild anaphylaxis reacted with dilutions of the tetanus antitoxin which had been used to inoculate him, but not with normal horse serum. Other examples of extreme specificity mentioned by Professor Dean were the production of specific antibody by the injection of the proteins or antigens of the lens of the eye, and the antigenic differences between the protein fractions of one and the same sample of serum as shown in Dale's experiments by the use of the guinea-pig uterus. In the second part of his paper Professor Dean considered the significance of a positive serum reaction. In typhoid and allied infections the significance of a positive reaction was purely diagnostic. In the case of the Wassermann reaction there was, in addition to the diagnostic, a therapeutic and prognostic interest. The complement fixation tests for gonorrhoea and tuberculosis were by no means so firmly established. In the days when the opsonic index was a popular method of diagnosing tuberculosis it was claimed that the majority of tuberculous patients could be shown by the opsonic index method to be deficient in antibodies. At the present time the complement fixation reaction was more popular or was regarded as affording better prospects of success. Even if the specific opsonin was quite a different kind of antibody to the complement fixing antibody it would be remarkable if tuberculosis could be recognized by deficiency of the one and superabundance of the other. Judged by the one reaction tuberculosis was to be suspected if the antibody content of the serum was below normal; judged by the other if the antibody content was above normal. Thus our interpretation of the significance of a positive reaction was somewhat empirical and founded largely on the practical experience of different workers, using different reactions for the diagnosis of different diseases. Professor Dean considered that the facts could be covered by the hypothesis that the formation of specific antibody was induced by the introduction of the antigen into the animal body, was continued as long as the antigen persisted in the tissues, and came to an end when all traces of the antigen were destroyed. A positive serum reaction would thus be evidence of the existence at that time of antigen in the tissues. Evidence in support of this hypothesis was cited from experiments designed to test both the presence of antigen and antibody in the tissues. The sharply localized reactions which sometimes appeared when soldiers received repeated injections of antitetanus serum might be explained by the existence at these spots of a surviving and limited focus of antibody formation, and such a small focus of antibody formation situated at the spot where a trace of the originally injected antigen still persisted might have acted as a sufficient stimulus for the production of a small quantity of antibody. In conclusion Professor Dean pointed out that whereas during the last twenty years there had been progress in technique and much ingenuity had been directed towards the improvement of existing methods, very little effort had been made towards the solution of the underlying problems involved in serological reactions.

SECTION OF NEUROLOGY AND PSYCHOLOGICAL MEDICINE.

Wednesday, July 25th.

THE proceedings of the Section opened with a discussion on the nervous child. The President of the Section, Dr. H. Devine (Portsmouth), took the chair, and in a brief introductory speech sketched the scope of the Section's work, emphasizing the change of outlook of psychiatry, which was now coming to be regarded more as a branch of general medicine. A very interesting and lively discussion ensued, which was closely followed by a large and attractive audience.

Dr. Hector Cameron (London) opened with a paper which was full of interest, wit, and great psychological insight. He began by drawing attention to certain physical peculiarities which characterized the nervous child. These he classified as amyotonia, resulting in a characteristic stance, with lordosis and a protuberant abdomen, as pallor from a vasomotor anaemia, as postural or lordotic albuminuria. Further characteristic physical symptoms were attacks of abdominal pain which might be mistaken for chronic appendicitis, enteroptosis, and constipation. Such children, again, possessed but a low immunity to infections, especially of the catarrhal kind. Frequently also irregularities of the temperature were found. The origin of many of the nervous symptoms was to be found in a study of the parents. The young child was highly suggestible, and very quick to catch and make the most of any anxiety which is aroused in the household by its refusal to take food, etc. Timidity on the one hand and excessive foolhardiness on the other could be traced to faulty management on the part of the parents. Nervous children often displayed a strongly negativistic attitude, which could be well seen in certain cases of anorexia nervosa. The desire to attract attention or self-assertion was another common symptom in the nervous child, which might sometimes explain acts and behaviour which were either distressing or even indecent. Dr. Cameron illustrated his paper by several interesting slides, showing the characteristic stances and postures of the type of child under discussion.

Dr. McFie Campbell (Boston) agreed that physical infirmities might be reflected in behaviour defects. The psychologist, however, would be most interested in those cases where no physical defects could be found, and such cases could include loss of sleep, anorexia nervosa, morbid fears, and a whole variety of failures of adaptation to environment. Parents should realize more that children were not merely an appanage of the household, but were individuals. The suggestions of the mother not seldom caused great difficulties, and in the treatment of these cases the whole home life of the family must be carefully studied. Children should be more left to develop their own individuality. Dr. Helen Boyle (Brighton) welcomed Dr. Cameron's paper, especially as it combined the study of both the physical and mental aspects of these cases. She

wanted to emphasize the value of the typical stance described by Dr. Cameron, and compared it to the post-war posture of the modern young woman. She had notes of 40 cases, of which 20 had a bad stance; in the majority of cases this tended to get well. She commented on the memory of many young children, and also on the desire to conquer, which in some cases might take unpleasant shapes. Dr. W. A. Potts (Birmingham) wished to stress the importance of a very thorough physical examination, which should include as far as possible the function of the endocrine glands, for in some cases excellent results were obtained by small doses of thyroid gland. A lack of good parental control was most injurious to the child; example was the best form of psychotherapy. Parents should remember their own childhood and not interfere with the child's development by excessive anxiety. Sensation should be studiously avoided. Every child should have some simple religious instruction, and also instruction in the elementary facts of reproduction from its mother.

Dr. Crichton Miller (London) was sorry that Dr. Cameron had not gone further into the question of the etiology. He suggested that a faulty calcium metabolism might produce other effects than mere skeletal deformities. But physical inferiority was not always a mark of the nervous child. Faults of parental control could produce bad results even in a perfect physical specimen. A fundamental point in treatment was, as he expressed it, to "switch off the limelight," for in many cases the child showed a "glory" in his misdeeds. He mentioned especially nocturnal enuresis as a symptom for which archaic forms of treatment still persisted. It was the supreme symptom of infantility and the life of the cradle, and was often used as a defence against unpleasant realities such as school. Sir Robert Armstrong-Jones (London) congratulated the Section in that the subject had been so ably treated by a general physician, as well as by psychiatrists. He recalled the pedagogic maxim of "Don't say don't," and emphasized the value of making the child feel its own responsibility. He should be encouraged to see what was the rational end of his behaviour and his peculiarities. The importance of sleep had been hardly adequately emphasized, and such nervous children should be made to rest for twelve hours out of the twenty-four. In conclusion he would point out the threefold parts of the child—physical, mental, and spiritual—all of which must receive proper attention and study. Dr. R. G. Gordon discussed the psychological causes of the various special symptoms such as suggestibility which had been brought forward by Dr. Cameron. The personality was formed by the interaction of the inborn dispositions and of the environment. Many nervous children were backward, and a few were mental defectives. A neurological basis, especially disease of the frontal lobes, must not be forgotten. Environment, however, was all-important. Dr. Harford discussed the occurrence of squints in nervous children, and the connexion between squints, left-handedness, and stammering. He spoke favourably of psychotherapy, especially of carefully guided auto-suggestion. Mr. Inman was called on by the President to give the meeting an account of his work on squints in children, and he gave an interesting summary of his conclusions on the connexion between left-handedness, squints, and stammering.

Dr. Parry (Brighton) thought that the nervous child was more common now than twenty years ago, especially amongst the Jewish people. He was strongly opposed to the treatment of these cases by psycho-analysis. Dr. Peter Macdonald wished to draw the attention of the Section to the work of Alexander in the formation of the correct posture for man, and described the good effects which he had personally experienced from his method of treatment. Dr. Cameron briefly replied to the points raised in the discussion.

SECTION OF OPHTHALMOLOGY.

Thursday, July 26th.

THE President of the Section, Sir John H. Parsons, said it was his privilege to welcome a satisfactory attendance of members and visitors to the Section, and to express the gratitude of them all to their colleagues of Portsmouth. An interesting programme had been provided for them. Mr. Ransom Pickard of Exeter, Vice-President of the Section, thereon took the chair, and called upon Mr. A. H. H. Sinclair of Edinburgh to introduce the subject for discussion—the clinical significance of scotometry. Mr. Sinclair briefly outlined the great advances that had been made in recent years in this mode of clinical investigation. The work of Bjerrum had produced great changes in our methods. They had now a most delicate test due to the general adoption of small objects. He showed charts of the normal field, with its variations due to diminution of the size of the test object, the conformation of the blind spot, the amblyopic zone about it, and its extensions due to the obstruction produced by the trunks of blood vessels. In pathological conditions all these features were subject to variation. There were areas of depression in the general fields, the amblyopic areas were extended, and near areas of saturation or scotomata appeared in these latter areas. Detailing the variations of those conditions in various diseases, he contrasted those found in toxic states such as tobacco amblyopia, depressions such as severe anaemias, glaucoma, and direct affections of the optic nerve by local inflammations and growths. He insisted that, invaluable as were the clinical significance of fields of vision and their variation, they must be always related to other clinical symptoms—each was complementary to the other. Dr. Gordon Holmes (London) emphasized the variability of the results obtained in perimetry according to the mental level of the patient and also to the general mental outlook or attitude of the patient. Tests must be adapted to the patients, and even so in some patients the findings were not satisfactory. Mr. Malcolm Hepburn (London) dealt specially with variations in the fields due to choroidal disease. Mr. H. Neame (London) illustrated the variability of scotomata due to pituitary tumours. Mr. Bishop Harman (London) emphasized the necessity for simplicity and uniformity of tests. Mr. Aubert Kerry (Montreal) and Major R. E. Wright (Madras) put questions on the charts demonstrated. Sir John Parsons (London) explained some of the physiological aspects of these tests, and remarked that there was much to be learned concerning them. Mr. Ransom Pickard (Exeter) demonstrated charts correlating fields, tension, and size of cups in the discs. Mr. Sinclair, in reply, agreed with the desirability of the use of standardized tests; nevertheless, there would always be difficulty in delineating relative conditions.

SECTION OF PUBLIC HEALTH.

Thursday, July 26th.

THE Section was opened by the President, Dr. Mearns Fraser, and Dr. Wheatley (County Medical Officer, Shropshire) introduced a discussion on the factors contributing to the recent decrease in infantile mortality and whether such factors were likely to be permanent or temporary. Dr. Wheatley exhibited charts showing the variations in infantile mortality since 1841, and the relationship of these changes to legislative measures such as the Education Act of 1870, the Public Health Act of 1875, the Housing of the Working Classes Act of 1890, the Midwives Act of 1902, the Notification of Births Act of 1907, etc. He showed that there had been no fall in the rate from 1841 to 1900, but that since then the fall had been large and continuous. The fall in the general death rate had been continuous though comparatively small during the sixty years previous to the fall in the infant rate. He suggested that the factors —improved sanitation, etc.—which had reduced the general death rate had been neutralized in the case of infant mortality by other opposing factors. These he found in an increased prosperity among the working classes without increased education or improvement in a sense of responsibility. In these circumstances increased prosperity was a danger to infant life as it tended to increase drinking and to reduce the amount of breast-feeding. The effect of the Education Act was seen, as would be expected, in a reduced mortality in the generation following its passing. An analysis of replies to inquiries received from the medical officers of health of forty-four towns showed that twenty-five attributed the reduction to health visiting and child

welfare work with better midwifery service. Two gave better education as the cause, four reduced birth rates, five improved sanitation and social conditions, and two the use of dried milk. He personally had come to the conclusion that the principal factor was improved education, both general and special, and that there was good reason to believe this improvement would be permanent. In the discussion that followed Dr. Peeke (Derbyshire) thought that Dr. Wheatley had underrated the effect of improved sanitary conditions, especially the conversion of privy middens. He also regarded the introduction of summer-time as a factor of importance. Dr. Brackenbury (Hornsey) agreed with Dr. Wheatley as to the supreme importance of education, including direct instruction in personal and domestic hygiene. He thought the effect of the work of the child welfare centres had been exaggerated. Dr. Kirkhope (Tottenham) emphasized the importance of the education given to mothers at the pre-natal and infant clinics. Dr. Clark Trotter (Islington) contended that the most important part of child welfare work was in visiting the homes and thus improving the environment of the child. Dr. Miller (Radnorshire) had found a lower percentage of breast-feeding in rural than in urban districts. He agreed that home visiting by health visitors was the most important factor in hygienic education. Dr. A. Bullough (County Medical Officer, Essex) observed that heredity had an unfavourable influence on infant mortality, since the careless mother often had the largest family. The mother formed the true environment of the child, and everything depended on her knowledge and character. Education fitted her to receive the instructions of health visitors and others. Professor Wynne (M.O.H. Sheffield) expressed some scepticism as to the value in these respects of the instruction given in elementary schools. Dr. Wheatley replied on the various points raised in the discussion, and maintained the supreme importance of education and the real value of the existing system.

Dr. H. Scurfield read a paper on the value of watercress in dietetics, especially to urban communities. Watercress, he said, was a form of green food eaten uncooked and available at low cost all the year round. Its value as an anti-scorbutic was well known, and there was reason to believe that it was also rich in the other vitamins, as well as containing iron, iodine, and calcium. In some of the large cress farms he had visited every care was taken in its growth and handling, and the danger of infection with typhoid fever or other water-borne disease was eliminated. Inspection of such watercress beds was a simple matter. Dr. Smedley said that watercress had fallen out of favour in this country, though it was largely consumed in France with excellent results. Dr. Wheatley hoped that careful experiments into the dietetic value of watercress would be made, as general impressions were not sufficient to act on in view of the possible risk of infection as disclosed by the late Sir Shirley Murphy. Dr. Scurfield, in reply, pointed out that he advocated only the increase of watercress produced on a large scale and under sanitary conditions.

SECTION OF DISEASES OF CHILDREN.

Thursday, July 26th.

IN opening the first discussion, on acidosis and alkalosis in children, Dr. Cammidge said that it was important to understand clearly what was meant by those terms. Acetonuria had been and often was used synonymously with acidosis, but the two conditions were by no means identical and either might occur without the other. The term ketonuria should denote the presence of acid products of abnormal metabolism in the urine, and acidosis should be reserved for the true condition. During metabolism there was a tendency for acid bodies to appear in the blood, but the reaction of blood and tissue was kept constant by the action of buffer substances. The entrance of acid products into the circulation decomposed some of the bicarbonates and produced a relative excess of carbon dioxide. The respiratory centre was thereby stimulated and the carbonic acid was eliminated by means of the lungs. Normally the alkaline reserves of the body were quickly replenished, but in pathological conditions they might be depleted and the percentage of bicarbonate in the blood permanently diminished. There would be a corresponding reduction in the capacity of the blood to transport carbon dioxide, which would accumulate in the tissues and give rise to symptoms of suffocation and finally death. Acidosis, then, was a condition in which the concentration of bicarbonate in the blood was reduced below the normal level. Acidosis in children occurred chiefly in diabetes and in cases with recurrent "bilious attacks." Nothing had been published on alkalosis in children as far as he knew.

Dr. Ruth Verney (Edinburgh) gave the results of her investigations on buffer substances in the blood in children. Protein acted in this way, as well as weak acids and bases. One of the most powerful buffers was haemoglobin. The President, Dr. Edmund Cautley, mentioned his own uncertainty in regard to the differentiation of acidosis and alkalosis and their effects. He asked at what stage ketosis became acidaemia. Dr. E. P. Poulton said that although he himself had suggested some three years ago the nomenclature adopted by Dr. Cammidge, he now preferred the terms alkalaemia and acidaemia as connoting a diminished or an increased hydrogen ion concentration. He referred to the clinical and experimental aspects of the association of alkalaemia with tetany. Dr. Eric Pritchard considered that health in children depended more on the extent of the alkaline reserve than on any other condition. The kidneys were not the only means of getting rid of metabolic products; the faeces were probably a more important source of elimination of bases. In premature infants the absence of a calcium reserve constituted a serious danger. Dr. Catherine Chisholm said that in her experience acidosis occurred frequently in pneumonia, and that the disease responded quickly to large doses of alkalis. Dr. Cammidge replied to the discussion.

Colonel R. J. Blackham read a paper on cow's milk in infant feeding. He discussed the form in which cow's milk should be used when breast-feeding was impossible. Raw milk was dangerous because of the bacterial infection it could engender. Besides sterilizing the milk, heat had the advantage of diminishing the toxic properties of foreign casein. In the speaker's experience condensed milk was apt to make a child fat, flabby, and dull. Milk powder had the advantage of uniformity, while it was less liable to contamination and retained most of its vitamin content.

SECTION OF LARYNGOLOGY AND OTOLOGY.

Thursday, July 26th.

IN opening the discussion on internal ear deafness, Dr. Dan McKenzie (London) began by deploring the disparity between our anatomical as opposed to our pathological knowledge of the labyrinth. He described the well known difficulty of assessing the value of tuning-fork tests in deciding whether a case was of middle or inner ear deafness. With regard to obstructive deafness, nobody had thrown a doubt upon the correctness of the inferences to be drawn; but he described a case in which all the classical signs of nerve deafness were present in which removal of impacted cerumen was followed by immediate relief from all deafness. Mixed deafness was the commonest type of all, and the affection of the labyrinth in these cases might be merely a functional derangement. The commonest cause of nerve deafness was middle-ear disease, and the prognosis of nerve deafness in middle-ear disease was grave unless the latter could be arrested. Myxoedematous deafness was of this type, but yielded readily to thyroid medication. He next dwelt upon the relation between the vestibular reflexes and nerve deafness; they coexisted in acute but rather in chronic labyrinthitis. Vertigo might attend upon almost any ear disease, but tinnitus was usually tympanic. Having dealt with noise deafness, senile deafness, syphilitic and toxic, he concluded by sounding a note of hope even in the present state of ignorance. Thirteen speakers took part in the discussion. Mr. Mollison (London) grouped deafness into qualitative and quantitative. In the qualitative types there was a loss either of the upper or lower tones, whereas the remainder of the scale was unaffected. In quantitative deafness there was an alteration all along the

line; some of the quantitative cases were familial, some toxic, and some due to depression or elevation of sensitivity. He mentioned the relation between Paget's disease and nerve deafness, and gave notes of a case. He dwelt upon the importance of the lowering of the upper tone limit, and of the use of the monochord in diagnosing nerve deafness. He described cases of astounding acuity of hearing in the blind and in certain types of neurasthenics, where whispers could be heard round several corners. Perhaps the canals were getting less valuable to man. Mr. A. J. Wright (Bristol) classified 71 cases from the point of view of etiology; those with an obvious cause, such as trauma and syphilis, offered no difficulty. Of the remainder, two-thirds were females. In these doubtful cases septic foci accounted for a certain number, some were functional, and in these one could find a history of some *suggestion* at the outset. Of the remainder, childbirth, thyroid deficiency, and vasomotor rhinitis accounted for the majority. Sir James Dundas-Grant (London) discussed senile deafness, vertigo (which in middle-ear disease was caused mechanically), the value of quinine in unilateral labyrinthine vertigo, tuning-fork tests, war cases, traumatism, deaf-mutism, and numerous other points. Mr. Leighton (Manchester) said syphilis was not to be overlooked, emphasized the psychological factor, described a labyrinthine storm relieved by inflation, and mentioned the importance of caloric tests. The President said the speeches had brought out the important point that in a large proportion of cases of internal ear deafness evidence of middle-ear disease was present. Many cases of so-called nerve deafness were possibly due to disease in the foramen rotundum. It was important that all cases of hyperostosis of the meatus showed signs of deafness of the internal ear type. He had not found during three years with the army any chronic deafness caused by quinine or by malaria.

Mr. E. D. D. Davis (London) read a workmanlike paper on retrobulbar neuritis of nasal origin. He and most of the speakers agreed in finding it a sufficiently rare disease. Out of 54 cases in only 4 could he prove the existence of sinusitis. Sir StClair Thomson (London) condemned a tendency in some countries to operate upon sinuses without evidence of disease, simply because improvement had followed such steps on occasion. They must draw the line somewhere. Dr. Ritchie Rodger and Mr. Somerville Hastings, on the other hand, had seen dramatic improvement after opening sinuses apparently healthy. Mr. H. D. Gillies (London) read a too short paper upon the treatment of deformities of the nose, with special reference to the nose of tertiary syphilis; it was illustrated by lantern slides of dramatic interest. The treatment rested upon a diagnosis in terms of the structures lost by the disease; a two-stage operation was necessary—the first to restore the lining, and the second the cartilage. Previous failures had been due to an omission in regard to the lining.

SECTION OF RADIOLOGY AND ELECTROLOGY.

Wednesday, July 25th.

IN the Section of Radiology and Electrology, which was presided over by Dr. S. Gilbert Scott, a discussion took place on the *x*-ray examination of the urinary tract. The discussion was opened by Dr. R. W. A. Salmond, who pointed out the enormous advances in urology in respect to more accurate diagnosis which had taken place since the advent of *x* rays. The success of *x*-ray examination of the urinary tract might be said to depend on two main factors—namely, proper technique and accurate interpretation. The latter could only be obtained by combining the experience of the radiologist with that of the urologist. The speaker proceeded to give a detailed account of the most suitable *x*-ray apparatus, the preparation of the patient, the technique of exposure, and the routine of examination. He considered that radioscopy of the urinary tract was of considerable value, not only because stones could be seen, especially the larger kidney and bladder stones, but chiefly because the relative movement of a supposed stone shadow to that of the kidney and its direction of movement with respiration could be determined. Radioscopy was also of great value in the diagnosis of movable kidney. Turning to the more special technical methods which, although they might not be employed in every case, were in everyday use in selected cases, the speaker discussed the perirenal injection of oxygen, the method of pneumoperitoneum, colon inflation, and pyelography. He dealt next with the interpretation of the various shadows found in the region of the urinary tract and their differential diagnosis, and the abnormal shadows of the outline of the kidney or bladder. The investigation of conditions of the urinary tract other than stone demanded careful and elaborate technique, for here one had to depend largely on the outlining of the soft organs. He concluded by saying that all *x*-ray examinations of the urinary tract should be done so carefully that a negative opinion as regards stone might be of real value, bearing in mind, of course, that such an opinion did not exclude a uric acid stone. There had been many mistakes in diagnosis by *x* rays, and there probably always would be some, as in every branch of medicine and surgery; but some of the shortcomings of *x* rays in this work would probably be avoided if only a closer relation existed between the clinician and the radiologist. The discussion was continued by Mr. Ogier Ward, who contradicted the opinion generally held by medical men that pyelography was difficult, painful, and dangerous; it was not more than irksome. He deprecated the use of an anaesthetic, because one of the chief guides a practitioner had as to the filling of the renal pelvis was the patient's complaint of discomfort, at which stage one knew that the dangerous limit was being reached. He exhibited lantern slides illustrating the value of pyelography. Dr. L. A. Rowden thought that sufficient attention had not been drawn in the past to the value and simplicity of screen examination, combined with palpation, in diagnosis of urinary calculus. He asserted that he could have seen, on screen examination, with proper technique, every shadow that he saw on the prints exhibited in the room. For many years past, during a large hospital practice, he had made positive diagnosis of stone in the kidney by that method alone. Dr. G. B. Batten regretted that Dr. Salmond had not referred to the very valuable method, introduced in Argentina, and demonstrated some months ago at the Royal Society of Medicine, of injecting CO_2 gas around the kidney. Dr. J. Metcalfe said that the success of radiography of the urinary organs depended largely upon the technique. Personally he should certainly depend upon his films in the great majority of cases; no eye was so sensitive as the radiographic film. The President, in summing up the discussion, laid stress upon the importance of paying attention to minute and apparently unnecessary technical details.

SECTION OF NAVAL AND MILITARY HYGIENE.

Wednesday, July 25th.

THE President, Sir Percy Bassett-Smith, opened the first morning's session with a general outline of the day's programme. Group Captain M. W. Flack then read his paper on "Some considerations in the estimation of physical efficiency." In the discussion which followed Surgeon Commander K. Digby Bell asked whether in doing heaving exercises holding of the breath was essential, and what was the best method of measuring abdominal breathing. The opener replied that in his experience it did not appear to injure a man to hold his breath up to a period of circulatory discomfort, but as a practice for educational gymnastics it was not to be encouraged. He agreed that abdominal breathing was hard to measure; callipers appeared to be the best means, and measurements were taken at the level of the tenth rib. Lieut.-Colonel C. R. Sylvester-Bradley, R.A.M.C., read a précis of his paper on some aspects of normality, with special reference to the selection of recruits. He asked whether in examining candidates all possible precautions were taken to put them at their ease, owing to the increase in pulse rate which the excitement of examination aroused. Group Captain Flack replied that all allowances were made for

nervousness and there was the difference in mental state between examiner and examinee to be considered; prowess in games he considered as very important as showing psychomotor responses. Lieut.Colonel N. J. Crawford Rutherford asked whether a standard could be arrived at to eliminate the number of recruits discharged within six months as unfit due to middle-ear disease. In spite of auroscopic examination of all recruits on enlistment, discharges for middle-ear disease continued to head the list. He also considered it advisable to put recruits through mental tests on enlistment in order to have some record of their mentality, and to prevent subsequent discharges as "mentally inefficient" when the recruit's mental attitude towards soldiering had altered. Lieut.-Colonel Salisbury Sharpe agreed that marked deviations from the average of stature either above or below were disadvantageous to the individual. He thought that the only satisfactory method of doing heaving tests was with a stop watch which could be started or stopped without any audible noise. The opener replied that a War Office committee had been appointed to deal with the question of middle-ear diseases. Aural surgeons were by no means unanimous in their opinions as to whether a recruit should be passed or not, and he cited a case where three specialists had differed. Time did not permit of Surgeon Commander K. Digby Bell's paper being read in the forenoon, but it was dealt with at a special demonstration at the Royal Naval School of Physical and Recreational Training that afternoon. Wing Commander H. E. Whittingham read a paper on the life-history and bionomics of *Phlebotomus papatasii*, illustrated by lantern slides. Major H. Home asked whether it was correct that phlebotomus fever could be diagnosed by the leucocyte count as claimed by certain German workers. Wing Commander Whittingham replied that it was possible as the result of a blood examination by an accustomed pathologist to give a fairly certain diagnosis.

SECTION OF TUBERCULOSIS.

Wednesday, July 25th.

AFTER a few preliminary remarks by Sir Henry J. Gauvain from the chair, Professor Axel Reyn read a paper on the artificial light treatment of lupus and other forms of tuberculosis. He said that the creator of this light treatment was the late Professor Finsen; time would not allow all the different investigations on which Finsen based that treatment to be discussed, and Professor Reyn dealt only with the results of light treatment in different forms of surgical tuberculosis and tuberculosis of the skin. At the beginning of his experiments Finsen used the sun as a source of light, but it became clear that if light treatment was to be of any great value in northern countries it would be necessary to use artificial light. In further experiments Finsen showed that the ultra-violet rays had the strongest effect, and he gradually came to employ artificial light alone, for the carbon arc light contained far more ultra-violet rays than the sun, whose ultra-violet rays were absorbed by the atmosphere. Finsen died before he could finish his work on light-bath treatment, and it was left to others to carry out the experiments laid down by him. Bernhard and Rollier were the first to use the sun bath for surgical tuberculosis. Having seen the excellent results that Rollier obtained, he (Professor Reyn) decided to try light baths in treating lupus vulgaris and various forms of surgical tuberculosis. Professor Reyn then showed on the screen some very interesting cases of lupus and tuberculosis of glands which had been cured by artificial light baths. In referring to *x*-ray treatment for glands, he contended that in the great majority of cases nothing but bad results were obtained. In the discussion that followed, Dr. Sequeira (London) directed his remarks to the following points: First, he maintained that failure was often due to a faulty technique. Secondly, the attack should be a combined one—namely, local and general. Excision of a tuberculous lesion should be practised when it was in such a situation that a resulting scar did not matter, but for a scar on the face Finsen light was the ideal procedure. Dr. Sequeira then showed photographs of cases treated by Finsen light in this country. He agreed with Professor Reyn that *x* rays in dry lupus was a treatment to be deplored, and maintained that it could do nothing but harm. Professor Russ said that wave lengths of all radiation had been measured and that it was becoming possible to predict the effect of different rays on diseased parts. Wave lengths from 3,000 to 2,000 Angstrom units were easily absorbed by animal and vegetable tissue. No radiation up to 3,000 would penetrate one millimetre of skin. Wave lengths from 3,800 to 3,000 were a very important series. Those parts of the spectrum responsible for clinical improvements should be ascertained so as in future to concentrate on those particular rays. Sir StClair Thomson described his visit to the Finsen Institute, and his observations of the results obtained in tuberculosis of the larynx. In Copenhagen he heard that 50 per cent. of arrests had been secured, and he thought this very possible, as local measures in addition to the arc lamp baths were employed. He asked for further directions as to technique and precautions. Dr. J. M. Johnston mentioned two cases of painful laryngeal tuberculosis in which the carbon arc lamp was used with great relief to the larynx; there was, however, no change in the pulmonary physical signs. In his reply Professor Reyn said that the light treatment was better carried out in England than in any other country. He agreed with Dr. Sequeira that other local measures should be combined with light treatment.

Dr. J. Gravesen (Copenhagen), in opening a discussion on the present position of surgical treatment of pulmonary tuberculosis, said that the particular kind of surgical treatment he would discuss was based upon experiences with artificial pneumothorax, the principles of that method having put an end to all previous devices, such as incision with drainage of cavities, and excision of lobes. The results of pneumothorax treatment must be judged according to the anatomical and physiological possibility of full benefit from the treatment. In order to determine the actual results and to justify further methods in cases where the induction of pneumothorax was technically impossible, it was necessary to classify the cases with regard to the influence exerted by the presence of pleural adhesions. Such classification had been utilized in the largest series of cases published on this subject—namely, that of Saugman (Vejlefjord Sanatorium, Denmark). Dr. Gravesen gave details showing how often adhesions made it difficult to obtain the full benefit of artificial pneumothorax, and what excellent results the treatment would give could the injurious influence of adhesions be removed. As a general indication for collapse treatment a case was considered suitable when no hope of lasting cure by ordinary sanatorium treatment or other special remedies could be brought about. Dr. Gravesen then discussed the treatment in various groups of cases. In those with complete or almost complete pneumothorax, but with localized adhesions, thoracoscopy with cauterization was practised. When artificial pneumothorax was impossible thoracoplasty should be performed, and two questions with regard to that operation were considered: (*a*) Should a partial or a complete thoracoplasty be done? and (*b*) Should the operation be performed in one, two, or more stages? In the discussion Mr. J. E. H. Roberts said it was not necessarily true that bad results were due to adhesions, but infection was more virulent in cases where adhesions were strongest. He had lately modified his views regarding the Jacobaeus operation for cauterizing adhesions. He believed that in many cases it was a good procedure, but in others the adhesions were so firm that thoracoplasty had to be performed. He urged the importance of careful preparation of a case to be subjected to thoracoplasty. He preferred not to rely on a local anaesthetic; gas and oxygen was the anaesthetic of choice. The after-treatment was as important a factor as the operation itself. The chest wall should be immobilized by strapping for at least ten days, and subsequently proper physical exercises should be practised to prevent scoliosis. Dr. Vere Pearson, in discussing the choice of patient for artificial pneumothorax, urged that a fair trial of sanatorium treatment

should first be given. He thought it unwise to refuse to operate because there was a possibility of adhesions being present. He maintained that the ordinary physical signs were more important than x-ray evidence. If a case was deemed suitable for thoracoplasty this operation should not be delayed too long. Dr. Burrell said that unilateral cases were those that benefited. Since every case was unilateral at first, artificial pneumothorax should be done earlier than was the practice; there was less likehood of finding adhesions in early cases. Mr. Tudor Edwards referred to shock after thoracoplasty. In cases where the blood pressure had been taken before and after operation there was no actual fall in systolic pressure if the operation was performed under local anaesthesia. He preferred to do the operation in two stages, as most of the cases which he got were at a late stage of disease.

SECTION OF ORTHOPAEDICS.

Friday, July 27th.

THE Section of Orthopaedics held its session on July 27th, with Mr. T. H. Openshaw, the President, in the chair. Among those present during the morning was Sir William Macewen. The proceedings commenced with a discussion on the operative treatment of osteo-arthritis. The opening paper, by Mr. R. C. Elmslie, gave an able general survey of the present attitude of orthopaedists towards the subject. Mr. P. Jenner Verrall, secretary of the Section, announced that by agreement those who had promised to speak had each been requested to confine their remarks to particular parts of the subject. He then gave a short account of certain less drastic procedures. Mr. Harry Platt described the methods he employed for hip cases. Mr. McCrae Aitken spoke of manipulative measures and minor open operations. Mr. Max Page spoke of the value of arthrodesis in cases of osteo-arthritis of the hip. Mr. Rowley Bristow spoke also on hip cases, emphasizing the fact that it was constant pain which provided the clearest indication for operation. He also referred to the problem of double severe knee disease. The President spoke of the importance of climatic conditions in this disease, and the factor of spasmodic adduction in the production of pain in the hip. Sir Robert Jones spoke of the value of manipulation, especially in adducted hips and the shock of large operations, and advocated his well known operation for osteo-arthritic hips in old persons. Mr. Elmslie then replied briefly.

Mr. E. Laming Evans read a highly scientific and interesting paper on acute rachitis in late childhood and adolescence, and showed interesting slides. The subject was discussed by Mr. Elmslie. Mr. Robert Milne gave a valuable communication on the prognosis of Legg's disease of the hip, illustrated by numerous slides. The subject proved to be highly controversial; Messrs. Aitken, Platt, Elmslie, and the President took part in the discussion, no very definite consensus of opinion being reached. Mr. P. Bernard Roth spoke on the treatment of fractures of the lower end of the humerus. The subject was discussed by the President. Mr. Naughton Dunn read a paper on congenital talipes equino-varus, its prognosis and treatment, emphasizing the importance of early and complete manipulation and prolonged fixation, and insisted that in bad cases open operation should not be delayed unduly. The President discussed Mr. Naughton Dunn's paper, and went on to read a short paper on some deformities of the os calcis, in which he gave a valuable description of fractures of the os calcis and the resulting deformities and painful symptoms, and indicated the methods he employed in treating these and other deformities.

SECTION OF VENEREAL DISEASES.

Friday, July 27th.

AT the meeting of the Venereal Diseases Section held on July 27th, with the President, Sir Archdall Reid, in the chair, the subjects under discussion were the prevention and treatment of chronic gonococcal prostatitis and vesiculitis, the opening papers being read by Mr. Kenneth Walker (London) and Dr. David Watson (Glasgow). Mr. Kenneth Walker, in introducing the subject of chronic prostatitis, laid stress on the frequency with which the prostate and vesicles furnished the gate by which organisms entered the blood stream. As a rule vesiculitis and prostatitis were associated conditions and the fact that the vesicle was a horizontally placed structure lying along and closely associated with the upper border of the prostate sometimes made it difficult to differentiate a prostatitis from a vesiculitis, so that mistakes in diagnosis might arise. However, as the treatment of the two conditions was in the main the same this was not of great importance. He then went on to discuss certain points in treatment, in particular prostatic massage, electric massage of the prostate, and diathermy, vaccines, and sulfarsenol. In Mr. Kenneth Walker's opinion a definite reaction was taking place against the excessive use of instruments, particularly in posterior lesions, where they were more than likely to damage the tissues and perpetuate the disease. Dr. David Watson then discussed the prevention and treatment of vesiculitis. He said that vesiculitis was a rare disease and that there was very little field for the extensive operative measures advocated by certain American urologists. Vaccines had not proved of much use, at any rate in the later stages of the disease. The whole success of treatment in gonorrhoea lay in avoiding secondary infections and such complications as vesiculitis and epididymitis. Mr. David Lees (Edinburgh) continued the discussion and agreed that such treatment as vaccine therapy and the injections of sulfarsenol were of use in the earlier rather than the later stages of the disease. Mr. Cambell (Portsmouth) divided cases of chronic prostatitis and vesiculitis into two types—those in which the lesion was associated with no symptoms and no metastatic troubles, and those associated with symptoms and such secondary complications as iritis. Vaccines were useful in the latter rather than in the former type. Another form of treatment that he had found of use was the application of heat to the prostate by rectal irrigation. Surgeon Commander Parnell agreed that vesiculitis was a rare disease and stated that he had abandoned all vaccines except the detoxicated variety. However, by the use of the latter the average duration of complicated cases at Haslar had been reduced from 70 to 46 days. Dr. Hudson (Newcastle) spoke of the danger of using too strong antiseptics for lavage, and Dr. Eastes (London) defended the position of the pathologist and claimed that many failures in vaccine therapy were due to failure to incorporate in the vaccine all the organisms and all the strains of gonococci that were responsible for the discharge. After the readers of the opening papers had replied, Sir Archdall Reid congratulated the Section on the excellent discussion that had taken place.

SECTION OF ANAESTHETICS.

Thursday, July 26th.

A WELL attended meeting of the Anaesthetics Section was held on Thursday, July 26th, at the Municipal College, Portsmouth, under the presidency of Dr. W. J. Essery. In declaring the meeting open the President, after expressing his regret at the enforced absence of the London Secretary, Dr. H. R. Phillips, through an accident, extended a warm welcome to his colleagues from other centres. He then called upon Dr. Harold Sington (London) to read his paper on anaesthesia for children. Dr. Sington first considered the preparation of a patient before the anaesthetic, and drew special attention to the importance of examining the urine completely in every case. Owing to its great importance he considered acetonuria in some detail. He next discussed the choice of an anaesthetic, mentioning that the Great Ormond Street Hospital staff were convinced that for children ether (preceded by a hypodermic injection of atropine) would always be the anaesthetic of choice. The operation for which gas and oxygen was peculiarly well suited was that for hypertrophic stenosis of the pylorus; ethyl chloride was very useful for dental extractions in childhood. Dr. Sington next discussed various practical points in the administration of an anaesthetic to a child, and concluded with some suggestions for making the recovery as free from discomfort as possible. The paper led to a lively

discussion of various points made by the author, in which Drs. Flemming, Wilkins, Featherstone, and Moore joined. Dr. Sington, in turn, replied in detail to each of his critics. This paper was followed by one from Dr. A. L. Flemming (Bristol) on fatalities from anaesthetics, which was in turn criticized by Drs. McNamara, Sington, and Mott. As time was pressing and there was still another paper to read, the President then called upon Dr. Flemming to reply. Dr. H. E. G. Boyle (London) next read a paper on anaesthesia by the gas-oxygen-ethanesal and the gas-oxygen-chloroform-ethanesal combinations, and illustrated the same by demonstrating his apparatus for the carrying out of these sequences. There being no time for discussion of this paper, Dr. Christopher Mayhew (Southsea) demonstrated a new apparatus of his own invention for the administration of warmed ether vapour, the chief advantages of which were, he claimed, its lightness and portability, the whole apparatus only weighing a little over a pound, and its warming cylinder being able to accommodate easily the whole of the rest of the apparatus when packed for travelling.

THE PATHOLOGICAL MUSEUM.

THE Pathological Museum contained a series of thirty-four separate sets of exhibits illustrating a great variety of pathological curiosities. Many of the specimens were used by the exhibitors for demonstrating subjects about which they spoke in the different sectional meetings, in the reports of which a record will be found of some of the exhibits displayed in the Museum. Other exhibits, not coming within the scope of subjects discussed in the sectional meetings, were explained in brief demonstrations in the afternoons.

On July 25th Dr. H. A. Miller gave an account of the effect of certain esters of unsaturated fatty acids in the tubercle bacillus when growing *in vitro*. The bacteria showed banding and beading appearances similar to those obtained by Sir Leonard Rogers with leprosy bacilli by treating them with chaulmoogra oil. He described experiments he had commenced on the treatment of guinea-pigs suffering from tuberculosis with these unsaturated fatty acids, the results of which had been encouraging. He used chiefly the ethyl ester of hydnocarpic acid, and also potassium linoleate and sodium morrhuate.

Sir Leonard Rogers described how, by first employing intravenous injections of the sodium salts of the fatty acids of chaulmoogra oil obtained from seeds of *Taraxtogenos kurzii*, he first produced reactions in leprous tissue with the breaking down of acid-fast bacilli, followed by great improvement of the patient. Subcutaneous injections did not produce reactions in leprous tissue, and were less effective than intravenous. He subsequently used sodium gynocardate and later olive oil, soya-bean, and castor oil, all with equally good results, and came to the conclusion that it was all a question of the unsaturated fatty acids. The ethyl esters were more convenient preparations, as they could be given intramuscularly. These unsaturated fatty acids probably acted by defatting the bacilli in the body. The addition of any of these substances increased the action of the ferment lipase, and treated cases had been shown to have increased lipase in the tissues. These substances probably acted, therefore, by increasing the activity and amount of lipase in the blood.

Dr. H. A. Harris demonstrated some beautiful specimens illustrating the relation between normal ossification and arterial distribution by the method of Spalteholz; also microscopic preparations of injected lymphatics by Hyrtl, and microscopic preparations of injected blood vessels by Thiersch. He showed specimens illustrating the bony changes in rickets, and radiograms showing the process of growth in the long bones of a child.

On July 26th Dr. Da Fano gave a demonstration on herpetic and epidemic encephalitis.

The first fourteen specimens were from the set from which the drawings illustrating the author's paper on herpetic meningo-encephalitis in rabbits were made. They clearly showed the intensity of the inflammatory process caused in the brain of receptive animals by the inoculation of either the content of herpetic vesicles or brain emulsions from animals experimentally infected in series. The changes seen in the specimens were independent of the route chosen for the transmission of the herpetic virus and were characterized by widespread small-celled infiltrations, intense nerve cell degeneration, and diffuse proliferative phenomena on the part of some of the fixed elements of the tissues affected (neuroglia cells, endothelia, adventitial cells, fibroblasts, etc.). In preparations from animals which either died or were killed a few days after inoculation the inflamed areas contained a great number of polymorphonuclear leucocytes which were seldom observed in epidemic encephalitis in man, but in preparations from animals which survived for longer periods foci of small-celled infiltration were found which, because of their composition and situation, could not fail to remind one of those described both in cases of lethargic encephalitis and in animals experimentally infected with the encephalitic virus. Three specimens of this series showed the small granular structures which were termed by the author "herpetic minute bodies," and might perhaps be the virus itself.

Specimens 15 to 25 were from an acute case of encephalitis, presumably epidemic. The case was particularly interesting because of its very rapid clinical course (death took place thirty-six hours after the onset of symptoms), and because of the intensity of the small-celled infiltrations affecting the white and grey substance of the medulla oblongata, pons, mid-brain, optic thalamus, and certain parts of the cerebral cortex. In addition, various haemorrhagic lesions were observed of a type unusual in epidemic encephalitis. The most important of these changes were shown in the specimens and corresponding drawings. In one of them the demonstration was given of very small granules, situated within polymorphocytes, and in every way similar to the "minute bodies" mentioned above.

Four specimens were from a chronic case of epidemic encephalitis in a child which was clinically investigated by Dr. Helen Ingleby. As shown by the microscopical preparations, lesions were observed in this case on the whole similar to those described in subacute cases of the disease.

Within or next to elements of the lymphocytic type "minute bodies" were again noticed, characterized by the same morphological and tinctorial properties as those shown by Dr. Da Fano in some of the other specimens, and particularly in the last one, prepared from the brain of a rabbit inoculated intracerebrally with an encephalitic virus sent from Stockholm by Professor C. Kling. The rabbit died about a month after inoculation, and the histological examination of the brain showed a certain degree of congestion associated with a moderate perivascular and subependimal infiltration chiefly consisting of small lymphocytes. In certain regions (areae rhinicae) many "minute bodies" were noticed either scattered in the nervous tissue or adherent to fragments of some protoplasmic material, probably the remains of degenerated nerve cell.

Lieut.-Colonel Buchanan showed thirteen lantern slides and twelve mechanical models illustrating the mechanics of midwifery, and Mr. E. P. Bertwistle demonstrated a series of radiographic prints showing the characteristic contour of soft parts as well as bony tissues.

On Friday, July 27th, Wing Commander H. E. Whittingham, R.A.F.M.S., showed a series of slides and drawings illustrating the life history of *Phlebotomus papatasii*.

He said that the Royal Air Force Sandfly Fever Commission had shown that the virus of phlebotomus fever was transmitted from generation to generation of *Phlebotomus papatasii*. This might be effected in two ways—either it was transmitted by heredity or the larvae infected themselves in the breeding grounds by eating the excreta or the dead bodies of the parent flies. It followed that prophylactic measures against the fever must be directed upon the fly, the habits and habitats of which must be understood. The life history of *Phlebotomus papatasii* covered a period of about eight weeks, the exact time depending on conditions of temperature and humidity. The ovum in its maturation showed certain changes in its surface markings, and on the ninth day caudal bristles appeared. A few hours later the shell broke on the dorsum by the action of the egg-tooth. The larva emerged and entered upon its first instar, lasting six days and ending with the first moult. In all the larva passed through four instars of about six days each, and four moults, during which there occurred not only increase in size but developmental changes, characterizing each period. With the conclusion of the fourth instar the larva entered on the pupal stage, lasting about nine days, before the emergence of the imago. The wings of the newly hatched fly were crumpled and moist. Until these dried the young fly could only crawl. The recognition of this stage was most helpful in detecting the breeding spots of the insect. During the night, when the atmospheric humidity was usually great, the wings could not dry. The process of drying was generally completed within three hours after dawn, and the mouth parts hardened

to allow of the sucking of blood during the first twenty-four hours of adult life. Copulation could take place within the next twenty-four hours, and eggs to the number of forty were laid six to ten days later. The length of life of the adult female fly in nature was about two weeks, though in the laboratory life might be prolonged for thirty days or more. In the summer only a third of the life of the insect was spent in the imago stage. It had been found possible, as in the specimens shown of the living larvae and adult flies, to prolong the larval stage considerably by the retarding effect of increased moisture or lowered atmospheric temperature. Hibernation of the insect occurred in the fourth larval stage. Several larvae had been kept in this stage for six months, and then, by reducing the amount of moisture and incubating at 80° F., pupation occurred. Fully formed imagines eventually hatched out of the pupae.

The demonstration arranged by Dr. Ford Robertson comprised microscopical preparations of the diphtheroid bacillus found within neoplastic cells and cultures of this organism isolated from the primary tumours and from secondary metastatic growths.

Reviews.

INTERFACIAL FORCES IN PHYSIOLOGY.

In his Herter Lectures on *Interfacial Forces and Phenomena in Physiology*[1] Sir WILLIAM BAYLISS brings together a large collection of most interesting data dealing with phenomena which are now held to play an intimate part in tissue activity, in the broadest sense of the term. The phenomena are for the most part, as the title indicates, those which make themselves manifest at the place or surface where two immiscible substances are in contact; the common contact surface of these two substances is referred to as the "interface."

The field covered in the course of the lectures is extraordinarily wide. The first four chapters deal with the more or less fundamental problems of physical chemistry as applied to physiology, such as heterogeneous systems in general, surface tension, and adsorption and colloids. In the chapter on adsorption stress is laid upon the relation of this phenomenon to the nature of the electrical charges on the surfaces, and in the chapter on colloids aggregation and osmotic pressure, the nature of proteins, viscosity, and imbibition are discussed. The following chapters deal with various substances and tissues of physiological importance. Chapter V deals with haemoglobin and its relation to oxygen and other gases. In Chapter VI on enzymes, their relation to adsorption and their mode of action, it is interesting to note that what is required "to control the sign of the activity of enzymes in the living cell is an effective method of changing the concentration of free water." Chapter VII deals with the properties of the membrane which covers the surface of living cells, its mode of production and the changes in activity, particularly in relation to the state of excitation of the cell. The electrical phenomena in living cells such as result from excitation are discussed in the following chapter. In the next protoplasm—that is, the cell contents—especially the part its structure plays, is examined. In Chapter X muscle, nerve, and gland, including the formation of lymph and urine and the action of drugs, are all briefly dealt with.

In a final general chapter the author maintains that physiology is a separate science which should be cultivated for its own sake and irrespective of ultimate practical applications. He deplores the fact that there is a tendency "in some quarters to confine the physiology taught to the medical student to that part of the science which is at the moment seen to be of immediate direct application to clinical practice." It may be deplorable, but the fact remains that were it not for the constant influx of medical students and the need of investigation of clinical problems, the facilities for the study of physiology would not be so ample to-day as they are. Let it be granted freely that physiology is a separate science, but it must also be admitted that the majority of those who pass through the courses have no intention of specializing in the subject.

The book in many ways is an interesting one and it is frequently suggestive, but on the whole it cannot be said to reach the high standard of excellence set by Sir William Bayliss himself. He has not given himself enough room.

[1] *Interfacial Forces and Phenomena in Physiology.* By Sir W. M. Bayliss, M.A., D.Sc., F.R.S., LL.D. London: Methuen and Co., Ltd. 1923. (Cr. 8vo, pp. ix+196; 7 figures. 7s. 6d. net.)

REGIONAL ANAESTHESIA.

In his book *Regional Anesthesia*[2] Dr. GASTON LABAT, now of New York, states that his object is "to afford the opportunity of acquiring rapidly a practical knowledge of regional anesthesia and to teach the reader how to use the method successfully."

The book opens with a chapter on method and instructions to operating-room nurses, followed by another on general principles of technique. The cranial nerves are then dealt with, special methods of blocking are described, and a full description given of the methods of inducing anaesthesia for the various operations on the head, face, jaws, tongue, tonsils, and teeth. Methods of blocking the spinal nerves are then described, and in succession follow chapters dealing with operations on the neck, upper extremities, thorax, abdomen, genito-urinary organs, rectum, and lower extremities. Intraspinal block, or spinal anaesthesia, is described and discussed in a separate chapter, and the book ends with a general discussion of the value of regional anaesthesia. The art of regional anaesthesia is comparatively new and has hitherto, with the exception of spinal and sacral block, been but little practised in this country. Latterly dentists have to some extent taken up the subject, but in general surgery it has received scant attention. The author, as is but natural, is an enthusiast for the methods he describes, but acknowledges that a long training is required if constant results are to be obtained. No hard and fast rule as to dose can be given, as considerable judgement is required to suit the dose to the individual. Failures to anaesthetize properly are met with, but these become rarer the more practised the administrator. A special knowledge of anatomy is necessary, as the anatomy taught to medical students is of little use in this particular art. The more complicated methods, in addition, require to be first practised on the cadaver. Dr. Labat states that it is always difficult to procure adequate anaesthesia for abdominal operations where the spinal block is not employed, or where it is not of use, as in upper abdominal operations. An experienced administrator will, however, succeed.

The chief advantages he claims for regional over general anaesthesia are: (1) that it is not dangerous to life; (2) that it ensures complete muscular relaxation; (3) that its main effects are confined to a relatively small region of the body; (4) that by its interruption of the sensory nerve conductivity the brain is protected from the effects of local operative injury; (5) that it reduces or eliminates operative shock when combined with narcotics such as morphine and scopolamine; (6) that it does not affect the general conductivity of nerves; and (7) that it shortens surgical convalescence.

The disadvantages of the method are not tabulated by the author, but a perusal of the text will show that such exist. Among these are: (1) possible undue susceptibility to novocain, the drug recommended by the author; (2) possible failure to ensure complete anaesthesia, especially in complicated operations, thereby necessitating the presence of a general anaesthetist; (3) apprehensiveness on the part of the patient, or any unusual psychical condition; (4) nausea while under the influence of the drug; (5) syncope or faintness, etc.

Another disadvantage which suggests itself is the time taken by the anaesthetist to bring the patient to the condition required by the surgeon. In hospital practice, where a large number of cases have to be dealt with at the same session, the time lost by all these preliminary manœuvres must certainly prolong to a considerable extent the length of the session and so lead to undue strain on the operating and nursing staffs. Selected cases could doubtless be so dealt with, but were the methods to be applied to every case extra theatre accommodation and extra staff, both surgical and nursing, would inevitably be required. It is questionable whether the advantages claimed for the new

[2] *Regional Anesthesia: Its Technic and Clinical Application.* By Gaston Labat, M.D., Lecturer on Regional Anesthesia at the New York University; formerly Lecturer on Regional Anesthesia, The Mayo Foundation. With a foreword by William J. Mayo, M.D. Philadelphia and London: W. B. Saunders Company. 1922. (Roy. 8vo, pp. 496; 315 figures. 35s. net.)

method are sufficient to counterbalance the disadvantages which its wholesale application would entail. That it has its uses in selected cases no one will deny.

The book is well got up, printed on good paper, and the illustrations are excellent, both from a practical and an artistic point of view. There is an adequate index and a foreword by William J. Mayo, M.D. Altogether the volume can be recommended to those who are interested in a new and growing department of the art of anaesthesia.

ARROW POISONS.

Die Pfeilgifte,[3] by Dr. L. LEWIN, is an encyclopaedic account of the arrow poisons used throughout the world. The author deals with each continent in turn, and proceeds region by region to give an account of the arrow poisons used by hundreds of different tribes of savages.

In most cases the sources of the poison, the mode of preparation, and the pharmacological nature of the poison, are all given. Many hundreds of different poisons are dealt with in this manner. Needless to say, such a book could only have been written by a scholar with a wide knowledge of toxicology and ethnology. In addition, much of the information concerning the pharmacology of the poisons is original work by Dr. Lewin. In his preface he states that the book is the product of thirty years' work.

The book will appeal to several classes of persons. The preparation of arrow poisons is usually a carefully guarded secret, and in most parts of the world the more civilized races drastically discourage the preparation of poisoned arrows by the more primitive races; this policy increases the difficulty of obtaining any accurate information on the subject. Dr. Lewin's book should therefore be of considerable value to administrators and doctors in such countries as tropical Africa and the Malay Peninsula, where the use of poisoned arrows is particularly prevalent. The work is essentially one of reference, and for this reason we would suggest that it would be improved by fuller indexing; an author index in particular would be of value.

The first impression produced by the work is one of surprise that the use of poisoned arrows should be so prevalent and that there should be such an amazing number and variety of arrow poisons. Whilst the art of healing is represented amongst most savage tribes by a confused jumble of superstitions which at the best are useless, but usually actively harmful, yet in the art of destruction even the lowest savages show a most surprising degree of skill and ingenuity. A misanthropist might be tempted to moralize on this, but in fairness to the savages it must be remembered that poisoned arrows are used for hunting as well as for war, and the more primitive the weapons the more essential is poison if large animals are to be attacked. The skill shown by savages at the lowest stages of culture in discovering poisons for weapons is surprising all the same. Dr. Lewin considers it certain that poisoned weapons were used in Europe as early as the Magdalenian period. This is the more unexpected as Europe is not rich in poisonous plants; indeed, aconite and white hellebore are almost the only European plants likely to yield an effective arrow poison.

Arrow poisons reach their highest efficiency and complexity in the Malay Peninsula, and some of the poisons prepared there are made from as many as twenty constituents, the chief being the juice of the upas tree, so famous in fable. It is remarkable that all over the world glucosides allied to the digitalis series, and obtained from the most varied sources, are used as arrow poisons. In West Africa strophanthin is obtained from the climbing shrub strophanthus, while in South America the natives obtain a similar type of poison from the poison glands of toads. In the Malay Peninsula antiarin, a glucoside with an action like that of strophanthin, is obtained from the upas tree.

The complexity of the arrow poisons is, however, in many cases purposeless—for example, the bushmen of South-West Africa use a poison prepared chiefly from vegetables, and add to it snake venom, but since they subject the mixture to prolonged boiling to bring it to the right consistency the snake venom must be rendered completely inert. Some tribes, however, know how to use toxalbumins such as snake venom for arrow poisons, for they drop the fresh poison on to the arrow and dry it in the sun. The bushmen of the Kalahari desert prepare a poison of great virulence from the larvae of a beetle (*Diamphida simplex*). Lewin found that one-quarter of the juice obtained from one larva, which weighed about two grains, sufficed to kill a dog. The bushmen, it is reported, kill lions with arrows poisoned in this way. In another part of the book the use of curare by the natives of South America is fully described, and physiologists will find a very complete description of the origin and constituents of the different varieties of this poison.

Dr. Lewin's book, dealing with all parts of the inhabited globe and with all periods of human history, contains a wonderfully interesting and full account of a very curious aspect of human culture. We believe it to be much the most complete treatise that has yet appeared on this subject.

[3] *Die Pfeilgifte: nach eigenen toxicologischen und ethnologischen Untersuchungen.* By L. Lewin. Leipzig: J. A. Barth. 1923. (Med. 8vo, pp. xi+516; 75 figures, 1 plate.)

THE PRACTICE OF PREVENTIVE MEDICINE.

ALTHOUGH it was not until the beginning of the present century that any serious efforts were made in Canada in the direction of public health organization, it is already being realized in the Dominion that curative medicine and preventive medicine are very closely allied, and that the general practitioner must not be ignored in any public health scheme. Dr. J. G. FITZGERALD, professor of hygiene and preventive medicine in the University of Toronto, has written *An Introduction to the Practice of Preventive Medicine*[4] with the object of outlining "some of the work of the physician who is to function on the preventive as well as the curative side of medicine." Although at the outset the practitioner may be alarmed at the sight of a volume of 800 odd pages which only outlines the subject with which it deals, he will not need to read very far before discovering that the author is an original thinker who is able to place facts and conclusions before his readers in an attractive and helpful manner. He looks forward to a time when everyone in the community will feel that an actual stigma attaches to one who has a preventable physical or mental disability and when the physician will be engaged to keep his patient well by routine examination, by supervision and advice. Nearly one-third of the volume is concerned with transmissible diseases, each being dealt with separately as regards its etiology, incidence, mode of transmission, and methods of control. With respect to the last, much sensible advice is given. For example, in the chapter on diphtheria the practitioner is reminded that he and not the laboratory makes the diagnosis, and that the bacteriological examination of a swab is only part of the evidence upon which a diagnosis should rest. Dr. Fitzgerald considers it highly desirable that the quantity of antitoxin which it is decided to administer should be given in a single dose, not in divided doses. He does not give much assistance in dealing with the difficulties connected with the control of diphtheria carriers. He admits that antitoxin is not a specific for the permanent relief of such carriers because it does not kill diphtheria bacilli but simply neutralizes any toxin they may produce. He considers that removal of diseased tonsils and of adenoids and the correction of deviations of the nasal septum may in many instances result in the disappearance of the germ because their lodging place has been removed or rendered unsuitable.

The control of measles in the mass is the despair of most public health officers; we turn, therefore, with interest to the advice tendered the family doctor who is attending individual cases. Stress is laid on the importance of the two earliest symptoms of measles—namely, rise of temperature and oedema of the conjunctiva. The temperature should be taken morning and evening, particularly on the eighth, ninth, and tenth days after exposure. The medical practitioner is urged to have clearly in mind the periods of incubation and infectivity of the disease and to remember that the

[4] *An Introduction to the Practice of Preventive Medicine.* By J. G. Fitzgerald, M.D., F.R.S.C., assisted by Peter Gillespie, M.Sc., M.E.I.C., and H. M. Lancaster, B.A.Sc. London: Henry Kimpton. 1923. (Roy. 8vo, pp. xx+825; 129 figures. 37s. 6d. net.)

danger of infection is greatest five days before the rash appears and five days after.

A very informing chapter on milk is contributed by Mr. H. M. Lancaster. It contains the text of the Canadian regulations with respect to the production and distribution of milk. Pasteurized milk, when delivered to the consumer, must not contain more than 100,000 bacteria per cubic centimetre. In Ontario the term "pasteurized" must not be applied to any milk unless it has been subjected for at least twenty and not more than thirty minutes to a temperature of not less than 140° F. and not more than 150° F., and then at once cooled to 45° F. or under and kept at that temperature till delivered to the customer. Dirty milk or milk from diseased cows is not permitted to be pasteurized. The chapter on public health organization in Canada should prove of interest to public health administrators in this country. In Ontario the local medical officer of health has permanency of tenure to the extent that he can only be dismissed from office with the approval of the Provincial Board of Health. The expenses incurred by medical officers of health in attending an annual conference are borne by the municipality.

A very well arranged index adds to the value of a work which is essentially one of reference, and the large number of excellent illustrations are helpful in elucidating the text.

ENLARGEMENT OF THE PROSTATE.

A comparison of the first edition of Dr. J. B. Deaver's *Enlargement of the Prostate* with the second[5] helps one to realize how great has been the progress achieved by genito-urinary surgery during the last ten years. In the first edition the statement appears that operation should only be advised for enlargement in those cases in which palliative measures have been tried without success. In the new edition operation is urged in all cases of enlargement unless some special contraindications, such as severe renal lesions or cardiac complications, exist.

It is in the section of the work dealing with operative methods that the most marked changes appear. With regard to the pathology and the causes that lead to enlargement of the prostate very little new knowledge would appear to have been gained. Diagnosis, however, has been rendered more exact by a clearer knowledge of the cystoscopic appearance of the condition. Notable additions appear in the chapter dealing with intraurethral operations for the relief of obstruction at the vesical outlet, such as contracture of the vesical neck, median bar formations, submucous fibrosis, and hypertrophy of the submucous glands. Dr. Deaver is not an enthusiastic advocate of intraurethral methods of treatment, and prefers to open the bladder and deal with the obstruction by the suprapubic route rather than to employ diathermy or division of the obstructing tissues by means of a punch. Another point on which the author lays emphasis is that when the obstruction is found to be due to a ball-valve enlargement of the prostate without any increase in size of the lateral lobes total enucleation is unnecessary, all that is required being the removal of that portion of the prostate that is responsible for the obstruction. He sounds a note of warning against attempting to do too much to some of the decrepit old men who apply for relief. "Their tenure of life is slight, and pressing our manipulations too far may at any moment loose the silver cord, and instead of curing the patient by a brilliant operation we shall have killed him by meddlesome, injudicious surgery." There are many who will agree that this warning is not entirely unnecessary. In discussing the relative merits of the suprapubic and perineal operations the author says that no genito-urinary surgeon can afford to confine his attention to either operation, but must be prepared to employ both. It is true that by the suprapubic route the majority of prostates may be removed, but there are always some for the removal of which the perineal operation is better suited.

An interesting chapter is that which deals with operative mortality; it is of great interest to note the different rates reported by the recognized leaders in prostatic surgery and those obtained by less experienced hands. If ever a justification were required for the recognition of urology as a definite branch of medicine and surgery these figures alone would supply it.

Altogether Dr. Deaver's book is one of the completest and most carefully compiled works on the subject of prostatic enlargement that has ever appeared. It is a book that should be of interest to all surgeons, but more especially to those engaged in genito-urinary work. The author has been ably assisted in his work by his collaborator Dr. Leon Herman.

[5] *Enlargement of the Prostate.* By J. B. Deaver, M.D., LL.D., Sc.D., F.A.C.S., assisted by L. Herman, B.S., M.D. Second edition. London: J. Bale, Sons, and Danielsson, Ltd.; Philadelphia: P. Blakiston's Son and Co. 1923. (Med. 8vo, pp. xii + 358; 141 figures. 7 dollars.)

ABDOMINAL PAIN.

Of books on abdominal pain one of the best and certainly one of the most successful is Professor Norbert Ortner's. It is a large work containing upwards of 400 pages, and first appeared in 1917. It is now in its third edition.[6] Some few weeks ago (May 5th, 1923, p. 770) we published a review of a book entitled *Abdominal Pain*, by Dr. Brams, late of the United States Army Medical Corps, and Dr. Luger, one of Professor Ortner's assistants. This was at once a translation and a condensation of the second edition of Professor Ortner's rather encyclopaedic volume. The original bears very fully the mark of the author's personality. We gather that he is an extremely careful clinician. He is one of those rare, but not always happy, people who remembers every possibility. It has been said that success in diagnosis depends not alone on the possession of a well stored memory, but rather on the faculty of recalling things known at the right time. It is obvious, however, that in order to be a good diagnostician one must first possess a wide knowledge of facts. When dealing with the abdomen, these must relate not only to the organs contained within the peritoneal cavity, but also to those within the thorax. The importance, for instance, of pulmonary and vascular lesions is not to be minimized. The reader of Professor Ortner's book is not likely to be allowed to forget anything. The symptomatology of thrombosis of the portal vein, of the aorta, rupture of the auricle, and so forth are all paraded for our inspection. This method of including everything possible has had its share of ridicule, and it is undoubtedly stupid when badly done. But when done well, as in this case, it must command our respect.

It would be doing Professor Ortner an injustice were we to give the reader the impression that the book was anything but a very able and clear exposition of the varieties of abdominal pain and of the significance of various types of pain. Professor Ortner has studied his cases carefully. Very brief case histories are sometimes included in the text in order to drive a lesson home. The chapter headings are arranged very conveniently on a regional basis. Thus under epigastric pain the reader will find a reference to every lesion, whether abdominal, thoracic, or spinal, which can give rise to pain in that situation. Professor Ortner makes his reader grasp the fact that it is only when a particular pain is the chief manifestation of a disease that that disease becomes important and diagnosable. To take tabes as an example: epigastric distress in a patient presenting every other sign of tabes or long known to be a sufferer from that disease is often not worthy of special record. It is only when epigastric pain is the outstanding symptom, and when in particular it occurs in a patient not suspected hitherto of tabes, that a problem is set the examiner for his solution.

OLD AGE.

A Green Old Age[7] is a translation of the second edition of Professor A. Lacassagne's medical summary of old age, and represents the mature conclusions of a distinguished physician now an octogenarian. Its matter is full of interest, but Mr. Herbert Wilson's translation leaves room for improvement, and sometimes arouses the suspicion that

[6] *Klinische Symptomatologie innerer Krankheiten.* Erster Band, erster Teil: *Bauchschmerzen (Schmerzhafte Bauchaffektionen).* Von Professor Dr. N. Ortner. Dritte, verbesserte Auflage. Berlin and Vienna: Urban and Schwarzenberg. 1923. (Sup. roy. 8vo, pp. viii + 453.)

[7] *A Green Old Age.* By Professor A. Lacassagne. Translated by Herbert Wilson from the second French edition. London: John Bale, Sons, and Danielsson, Ltd. 1923. (Demy 8vo, pp. xiv + 321; 17 illustrations. 15s. net.)

he is not entirely familiar with medical science—for example, the sentence "Salimbeni and Gery carefully examined the tissues of a woman of 93, in which were found little cells coming from the lymphatic ganglion and the spleen" has a rather unusual sound. The work is beautifully illustrated, especially the chapter entitled "The old as viewed by the artists," including Rembrandt, Jordaens, von Lenbach, and Leonardo da Vinci's portrait of himself, which is described as that of a man who has seen, judged, and suffered everything, and no longer expects anything from anybody, the head of a lion overcome by old age.

Although the worst record is presented by dramatists, poets, and writers of romances, the author concludes that the best prospect of a long life is found among the intellectual and actively minded. The view of various philosophers and men of letters on the physical and moral states of old age, from Cicero to F. Faguet (obiit 1919), are collected into a chapter which is followed by a detailed account of the structural changes. Old age is defined as a disease of the colloids, the protoplasm, and the interstitial tissues of the body. The mental characteristics and behaviour of old men are fully considered, with many references to well known historical personages, and to the views of Pierre Janet, Bergson, and Freud. The concluding chapter on the hygiene of old age contains much sage advice, recalling the directions of the late Sir Hermann Weber, who is duly quoted, on exercise, diet, and so forth. Sleep should last at least six hours and never more than eight, though bed may be utilized for work or reading; of books, the author's five favourites are the Bible, Plutarch's Lives, Horace, Montaigne, and Sainte-Beuve's *Lundis*. In conclusion, it may be said that Professor Lacassagne's essay is an interesting storehouse of information with a personal touch and a pleasant flavour of scholarly lore.

MORBID HISTOLOGY.

To the student commencing his practical studies in pathology, Dr. DONALDSON'S *Practical Morbid Histology*[8] should prove very helpful. The author's plan has been to select a series of pathological lesions which shall include all those usually studied in the class of practical pathology, and to describe each lesion in language very similar to that which would be used in demonstrating an actual microscopic slide. The student, with his slide before him, will find in these descriptions all the important points to be recognized in the section. By marking those points which he has succeeded in identifying he will be relieved of the necessity of making his own notes, which his inexperience is apt to render defective; and he will thus have a record of what he has himself observed and of any details that the section has failed to illustrate. Later in his course of studies the student will find the book useful as a reminder of his previous observations and the particulars in which his knowledge needs supplementing.

Dr. Donaldson has wisely refrained from inserting any diagrams or illustrations. There can be no doubt that a good figure is of very great value in conveying a correct idea of a lesion, and many would consider it superior to any verbal description. But this would apply only to experienced microscopists; and it cannot be too strongly impressed on beginners that one of the principal objects of the practical class is to teach him how to use the microscope for the observation and interpretation of pathological changes. Illustrations tend rather to relieve him of the necessity of making an effort to this end, and are best dispensed with, at least in the earlier stages.

The author has gone somewhat beyond the scope indicated by the title of his book, in adding fairly full descriptions of the macroscopical appearances of the affected organs. It is not unusual in classes of practical histology to introduce specimens from the museum or *post-mortem* room; the addition of these descriptions is therefore justifiable, and the student is placed in a position to judge how far the changes observed in the microscopical sections are recognizable in the naked-eye preparations. Of less value, perhaps, are the brief accounts of the pathogeny of the several diseases, which have been inserted with a view to forming a link with the textbooks of general pathology.

Forty pages are devoted to technical matters, including fixation, hardening, embedding in paraffin and celloidin, and staining. The instructions given are clear and full, and the staining methods recommended cover all that the student will require. A series of tables has been arranged in an appendix setting out the characteristics of the various worm parasites and their ova, together with brief notes regarding their life history. The book is one that will be welcomed alike by teachers and students.

[8] *Practical Morbid Histology.* By Robert Donaldson, M.A., M.D., Ch.B.Edin., F.R.C.S.E., D.P.H. With a foreword by Sir H. Rolleston, K.C.B., M.D. London: W. Heinemann (Medical Books), Ltd. 1923. (Demy 8vo, pp. viii+364. 15s. net.)

TOMES'S "DENTAL ANATOMY."

THE eighth edition of TOMES'S *Dental Anatomy*,[9] the standard textbook on the subject, has been edited by MARETT TIMS and BOWDLER HENRY. The book deals with both human and comparative anatomy and considerable additions have been made, especially to the description of the human teeth, but the work remains as captivating and absorbing as we found it on first acquaintance many years ago. We thought then, and we still think, that comparative dental anatomy was of no practical use to us, and we wonder what the dental student thinks now when the medical aspect of his profession is much more apprehended than it was thirty years ago. But Dr. Marett Tims is appealing not only to the dental student: he has in mind the anthropologist, and from this point of view we may suggest that an account of the common, or normal, variations of the human teeth might be included.

Remembering the preliminary report of the Royal Commission on Dental Caries, with its discussion of the existence and significance of organic matter in enamel, it is interesting to find the author roundly declaring that "there is no organic matter at all (in any noteworthy amount) in enamel"—and we are bound to say he seems to us to establish his point.

That dentine is (in evolution) the oldest calcified tissue is a point that will surprise and interest many. The assertion that there would seem to be very little doubt that the cementum (of the neck of the tooth) is sensitive is a point we should absolutely contradict on clinical evidence. We should have liked a better description of the upper wisdom tooth of the Talgai skull than that "it is large but with the usual characteristics of an unerupted tooth," and we do not quite understand the statement (p. 127), "small round aggregations of pavement epithelium are met with at a little depth or even embedded in the surface"—are they under the surface or exposed? But such faults are few, and every student of odontology will be grateful to Dr. Marett Tims and Mr. Henry for this enlarged edition. The short account of human prehistoric remains—among which Galley Hill Man is included—adds greatly to the interest of the book.

NOTES ON BOOKS.

THE first edition of Dr. ABRAHAM LEVINSON'S beautifully illustrated and finely got up monograph on the *Cerebro-spinal Fluid in Health and Disease* was reviewed in our columns (1919, ii, 634). The call for a second edition[10] has given opportunity for revision and addition so that the volume contains 46 more pages, 8 more illustrations, and costs 7s. more. The foaming of all pathological fluids on shaking, which lasts for half an hour or longer as compared with a persistence for a few minutes only in normal fluids, is of greater size and longer duration in acute meningitis, and has been shown by the author to be due to the increased protein content and not to carbon dioxide. In encephalitis lethargica the type of cell in the cerebro-spinal fluid is inconstant, being in some cases a small lymphocyte, in others the polymorphonuclear leucocyte, but the author has found that there is often an increase in globulin without a corre-

[9] *A Manual of Dental Anatomy, Human and Comparative.* By Sir Charles S. Tomes, Kt., LL.D., F.R.S., F.R.C.S. Eighth edition, edited by H. W. Marett Tims, O.B.E.(Mil.), M.A.Cantab., M.D., M.Ch.Edin., F.R.A.I., F.Z.S., with the assistance of C. Bowdler Henry, L.R.C.P.Lond., M.R.C.S., L.D.S.Eng. London: J. and A. Churchill. 1923. (Demy 8vo, pp. 547; 323 figures. 18s. net.)

[10] *Cerebro-spinal Fluid in Health and Disease.* By Abraham Levinson, B.S., M.D., North-Western University Medical School. Second edition. London: Henry Kimpton. 1923. (Med. 8vo, pp. 267; 5 coloured plates, 61 figures. 25s. net.)

sponding increase in the cells. The Lange colloidal gold test is illustrated by four coloured plates showing the reaction in tabes, general paralysis of the insane, tuberculous and meningococcic meningitis. This edition fully maintains the value of the book as a work of reference.

Mr. ZACHARY COPE'S little book on *The Early Diagnosis of the Acute Abdomen* has, of course, run into a second edition[11]; and this despite its title, to which some have taken exception. Perhaps, as medical students to-day have so limited a curriculum and so much time on their hands, they would benefit by a six months' course of lectures on nomenclature; but there is no "perhaps" about the benefit they will reap from six hours spent in reading these pages. A rereading after less than two years confirms the first impression of sound sense, simple description and no padding. Every house-surgeon should possess a copy, and if every man and woman who may have the care of acute abdominal emergencies would study such a work with zeal there would not be, in 1924, the 6,898 deaths from acute appendicitis, intestinal obstruction, and hernia recorded by the Registrar-General in 1921.

The object of Professor F. E. WYNNE'S little book *Ductless and other Glands*[12] is to give a popular account of their nature and functions for the enlightenment of the general reader and to prevent him from being carried away by sensational newspaper reports—for example, of rejuvenation by transplantation of glands. Whether in this instance a little knowledge is useful may be doubted, and in spite of the author's efforts the lay public may find difficulty in following the argument. Some of the statements are open to question—such as that the pineal gland is concerned with the metabolism of sugar, that the thymus is an endocrine gland, that the fat boy in *Pickwick* is a well observed clinical study of thymus deficiency, and that nettle-rash will be found to depend to a great extent on adrenal disorder. After quoting some cases of acromegaly observed by him in Dublin, there is the following charmingly ambiguous sentence: "Ireland has suffered from many victims of acromegaly, mostly cases in which the swelling has been limited to the head."

Dr. CHARLES FIESSINGER has written for the use of the general practitioner a practical and readable book, the outcome of forty years' experience, on prognosis.[13] An introductory chapter, in which the principal laboratory methods, including examination of serous fluids, blood, urine, cerebro-spinal fluid, and sputum are described, is followed by others on prognosis in diseases of the nervous system, the alimentary canal, liver, and pancreas, in infectious diseases, in respiratory disorders, in diseases of nutrition, especially diabetes, and in cardio-vascular diseases. In dealing with each group the author considers the prognosis according to the age of the patient, the symptoms, complications, forms of the disease, and the treatment adopted. A special chapter is devoted to diseases without prognosis—that is, those on the one hand which have a natural tendency to recovery, among which he enumerates acute tonsillitis, acute bronchitis, nervous dyspepsia, membranous enterocolitis, and certain eruptive fevers, such as varicella; and on the other, those which are inevitably fatal, such as malignant diseases of lung, liver, and pancreas.

As a "first lines" to the subject *Nursing of Diseases of the Eye*,[14] by the matron of the Royal Sussex Eye Hospital, can be safely recommended; there was need for a cheap book on this subject and the work admirably meets the want; those who wish to study theory more fully can buy one of the larger and more expensive books on the subject, but this little work contains a great deal of excellent advice in a small compass and should prove valuable to those who have to spend even a few months of their career nursing in the eye wards of a general hospital. The opening chapters on the structure and diseases of the eye are simply written and give as much information as it is necessary for a nurse to be possessed of. A chapter on the general nursing of eye cases is followed by one on methods of treatment and one on theatre work; lists are given of the various instruments required for operations on the eye and illustrations of the more important of them.

[11] *The Early Diagnosis of the Acute Abdomen.* By Zachary Cope, B.A., M.D., M.S.Lond., F.R.C.S.Eng. Second edition. Oxford Medical Publications. London: H. Frowde, and Hodder and Stoughton. 1923. (Demy 8vo, pp. xvi + 223; 28 figures. 12s. 6d. net.)

[12] *Ductless and other Glands: A Popular Account of their Nature and Function.* By F. E. Wynne, B.A., M.B., D.P.H., Professor of Public Health, Sheffield University. London: George Allen and Unwin, Ltd. 1923. (Cr. 8vo, pp. 127. 4s. 6d. net.)

[13] *Les Pronostics du Praticien en Clientèle.* By Ch. Fiessinger. Paris: Maloine et Fils. 1923. (Cr. 8vo, pp. 324. Fr. 10.)

[14] *Nursing of Diseases of the Eye.* By Jessie Elms, A.R.R.C. London: The Scientific Press, Ltd. 1923. (Cr. 8vo, pp. 70; illustrated. 2s. 6d. net.)

INTERNATIONAL CONGRESS OF SURGERY.

(*Concluded from page 147.*)

SERO-THERAPY AND VACCINO-THERAPY IN SURGERY.

IN the absence of Major Parker Hitchins of Washington, Dr. MICHEL (Nancy) opened the discussion by reading the paper of Dr. Bazy of Paris. Although knowledge of the general action of serums and of vaccines, and of their paraspecific effects in such a phenomenon as Widal's colloidoclasic shock, was important in modern surgery, they would not be able to make full use of the resources offered by sero-therapy and vaccino-therapy unless they realized to the full the value of specificity. Immunity and specificity were inseparable terms, and they could not confer real and durable immunity without specific intervention. Apart from serums having an especially antitoxic effect, such as anti-tetanic and antigangrene serum, most of the serums used in surgery were uncertain in their effect, at least as regards general infections. It was therefore advisable to draw attention to local applications of sero-therapy and to point out that injections of serum were less and less productive of effects as they were repeated. They should be reserved for cases of extreme need and used as a last resort. The use of vaccines was to produce in the organism a state similar to the condition it would be in if there had been a natural attack of the illness in question. This went to show that in surgery vaccination could not be claimed to produce any practical results, because surgical infections, when healed, did not confer immunity. Vaccino-therapy was chiefly used, and this consisted of the treatment of an illness during the stages of its development by means of the germ, more or less artificially modified, of the malady. Another method was to try to get a mixed immunization by a concurrent use of serums and vaccines, which they might call "sero-vaccination." Serum was a medicament to be used in cases of urgency, not as a curative remedy but to obviate infection and to produce a quick effect, not necessarily lasting. With vaccines only slow effects were to be looked for, but their effects remained longer. Sero-therapy and vaccino-therapy were of valuable assistance to the surgeon when operating. They were able to facilitate surgical treatment or to localize it; but neither serums nor vaccines were of any use in cases of necrosis or cicatricial lesions. The greatest attention should be paid to signs of susceptibility to microbes on the part of germ-bearers, for most cases of operation shock were caused by the sudden and startling development of an organism. The skilful use of vaccines and serums enabled them to anticipate this susceptibility and to counteract it.

Mr. D. P. D. WILKIE of Edinburgh said that happily infection after operation was rare, but the patient was especially liable to this complication after operations on the lower part of the alimentary tract. In fatal cases the organism found was usually a streptococcus; in cases which recovered it was the colon bacillus. If an animal were given two injections of a vaccine and thereafter an intraperitoneal injection of the organism sufficient to kill a normal animal, it lived. It could stand one and a half times a lethal dose. If it had been given a vaccine on two occasions, followed the night before the intraperitoneal injection by an injection of nucleic acid, it could stand three times the lethal dose. In patients undergoing a major operation on the lower intestine he gave, ten days before the operation, an injection of vaccine of streptococci and colon bacillus; three days before the operation he gave a second dose, and on the night before 8 c.cm. of 2 per cent. nucleic acid—this produced a leucocytosis of 12,000. He had done this on 63 cases where infection might be expected. There had been two deaths—in neither case apparently due to infection. It was a comfort to him, when a death occurred, to think of the animals upon which he had done intraperitoneal injections—those without the preliminary vaccines cold and dead the next morning, the others sitting up and eating their food.

Sir ALMROTH WRIGHT of London said that they should ask for what purpose might vaccine therapy be used. The

sterilization of their instruments, aseptic methods, were prophylactic measures against bacterial infection. It sounded like heresy, but it might be possible for a surgeon not aseptically efficient to vaccinate the patient against the few microbes he was likely to introduce. It might be heresy, but it was intellectually sound. There were certain cases they could not take precautions with, and the only way here was to raise the patient's resistance. Such operations were avulsion of teeth and excision of tonsils. A great many cancers came to the surgeon already infected with streptococci and staphylococci. He believed that the swollen arms seen after breast operation were due to streptococcal infection. What was the treatment of bacterial disease? Lister thought bacteria could be killed in the tissues by antiseptics. This was impossible and unsuccessful. The last thing an antiseptic would attack was the highly resistant microbe; an antiseptic would attack any other prey before a microbe. If they had organisms in a test tube and put in an antiseptic the chemical would attack the bacteria because it had nothing else to attack. The case was very different when an antiseptic was added to bacteria in an albuminous fluid. It went then for the fluid and not for the bacteria. Similarly it went for blood rather than the microbe in the blood. They could get better cultures from blood containing bacteria to which antiseptics had been added than from similar blood without antiseptics. The addition of antiseptics into blood or tissues was a fore-doomed failure. He wished to use certain new words. "Prophylaxis" meant to take protective precautions in advance. He would shorten this to "phylaxis." Hence the phylactic power of the blood was the power the blood had of taking care of itself. "Ec-phylaxis" meant a part into which the body fluids did not penetrate, as an abscess cavity—an ec-phylactic focus. "Kata-phylaxis" meant the bringing of the protective powers of the body to the part where they were needed. Surgical methods of producing kata-phylaxis were the opening of an abscess, the application of a fomentation or 5 per cent. salt solution. The last new word was "epi-phylaxis." If they could not get what they wanted by the blood, by kata-phylaxis, etc., then they might resort to epi-phylactic measures. They would never be able to do away with their operations, but they could increase resistance by epi-phylactic means. There might be a time when the patient's blood gave no immunizing response to vaccines; then if the abscess were opened and immediately another sample of blood taken an immunizing response might be given. Not every patient nor a patient in every condition could respond. If the patient's leucocytes were so poisoned that they could not respond, the first thing in treatment was to get rid of the microbes. For local infections a proper dose of a proper vaccine must be given. Pasteur said give a living vaccine; the speaker and others said give a dead one. Next arose the question of an autogenous or a stock vaccine. The more he considered this question the more difficult did it become to make out a case for the autogenous vaccine. A man with sixty furuncles might have a separate organism in each! There was justification for the autogenous vaccine if there were not a suitable vaccine in stock. With regard to dose it was most important to apply the right quantity. The only way to judge the right dose was to test the response of the blood. They could not possibly go by clinical symptoms. Vaccine therapy did a great deal if the right dose were given and the patient were capable of response. There were cases where the patient was so ill that one hesitated to give a vaccine. Would a vaccine to an already intoxicated system do good or just intoxicate more? In these cases the blood must be tested. If there was no response in the leucocytes it was useless to try vaccination unless the surgeon could come in first and get rid of the poison. Immuno-transfusion was the correct treatment in these cases. The normal and slightly ill man could give active immunization, but the graver cases needed passive immunization—serum therapy. In hospital the relatives should be warned, a compatible and willing man taken and inoculated with a suitable vaccine. In two or three hours the blood was drawn off, defibrinated, and 500 c.cm. introduced. Citrated blood should not be used since it pulled down the power of the leucocytes. It should be remembered that vaccino-therapy was not applicable to all diseases. The patient might be too ill for this treatment.

Dr. ALEXANDRE ZAWADZI (Varsovie) advocated the use of autogenous vaccines in septic cases and especially in cases of calculous cholecystitis. Vaccination was a great help to surgery in such patients. The operation ought to be considered as a first vaccination with living microbes. It should not be thought, however, that vaccino-therapy would help a case in which there was no vital resistance left. In especially acute infections it might be wise to vaccinate with living organisms, after the manner of Besredka. In cases where it was impossible to obtain microbes for culture purposes he had found that injections of sterilized milk or fresh white of egg helped greatly.

Dr. MAYER (Brussels) pointed out that vaccino-therapy helped, but should never be taken to replace surgery.

Dr. LECLERCQ (Morristown, New Jersey) and Dr. ZAHRADNICKY (Prague) also spoke.

OPERATIVE SHOCK.

Dr. CRILE of Cleveland, U.S.A., opened the discussion by elaborating a theory that men and animals were electro-chemical mechanisms to whom the laws of chemistry and physics might be applied in interpreting the action of therapeutic agents and measures. Each living cell consisted of two parts—the nucleus and the cell body—separated from each other by a selective semi-permeable membrane. The nucleus and body could not best be stained by the same medium, the one taking most successfully an acid stain, the other an alkali. The content of each, in the main, consisted of colloidal solutions. Two colloids of different reactions, separated from each other by a semi-permeable membrane, constituted an electric cell. Each cell of the organism was therefore a true electro-chemical unit—an electric cell. Since all organs and tissues of the body were multiples of these ultimate units, then each organ and tissue must be an electro-chemical mechanism, as must the whole organism. Careful measurements of the electrical conductivity of organs under varying conditions indicated that the first effect of stimulation within the organism was a slight decrease in the conductivity of the liver, followed by a rapid continuous rise in that organ as the state of exhaustion approached; a slight and prompt increase in the conductivity of the cerebellum followed by a gradual continuous fall; a relatively slower increase in the conductivity of the cerebrum followed by a gradual continuous decrease. Intracellular histological changes following excitation and exhaustion were paralleled by changes in electrical conductivity. Changes in the temperature of organs bore due relation to these facts. For instance, motor activity, either voluntary or produced by direct electrical stimulation of a nerve, was accompanied by rapid alteration in the temperature of the brain and liver corresponding to phases of muscular activity—these alterations, however, being in opposite directions. Water was essential to the activity of the cell. It was the only medium in which a colloidal system could be established; it had greater catalytic power than any other substance, and was a chemical activator; it had also a greater specific heat than any other substance, and was a non-conductor of electricity. Before oxygen became available for use in the cell it must be dissolved in water. Oxygen, the "acid-maker," was also essential. Oxidation produced acids, and these acids produced the essential alterations in the difference of potential between the nucleus and the cell body, and probably between parts within the cytoplasm, as the result of which accumulations of acid and an adaptive discharge of energy was provided. Water carried the oxygen in solution to the cells, dissolved the acid by-products of oxidation and bore them away from the cells. Thus it constantly restored the acid-alkali balance, which was as constantly altered by the acidulating oxidation. In accordance with the electro-chemical conception water and oxygen in a vital and inseparable relationship made possible the electric variations within the cells whose manifestations constituted life.

Since electricity flowed from a higher to a lower potential, and since oxidation in the brain was the highest, they

might suppose that the oxidation electric wave would pass down the nerves from the area of higher potential in the brain to the area of lower potential in the muscles and glands, and since the liver had the lowest rate of oxidation—hence the lowest potential—the current would finally reach that area, whence it would return through the electrolytic system to the brain, thus completing the circuit.

The following facts were interpreted by the hypothesis that the body as a whole was an electro-chemical mechanism, the positive pole being the brain; the negative the liver; the connecting wires the nerves; the salts in solution the electrolytic fluid in which the electro-chemical mechanism was immersed.

(*a*) When either pole—that is, the liver or the brain—was removed or destroyed, the organism perished.

(*b*) If the difference in potential within the cells, no less than the difference in potential between the poles (the liver and the brain), was dependent on the supply of electricity by oxidation, then, if the organism was deprived of oxygen, the existing difference in potential within the cells and within the organs was lost and equilibrium or death was established.

(*c*) Since the speed of chemical action and the electric conductivity were fundamentally controlled by heat and cold, it followed that in an electro-chemical mechanism there must be an optimum temperature as well as a lethal cold and a lethal warm temperature. Abdominal surgery in the colder months in unwarmed front area huts illustrated this point by a forbidding mortality rate.

(*d*) The opposite effects of stimulation and of exhaustion on the temperature and on the electric conductivity of the brain and of the liver, the muscles and other tissues in the splanchnic area would be explained by the conception that the driving power depended upon the difference in potential between the brain and the liver, muscles and other organs. Hence, if a stimulus caused only the potential of the brain to rise and the liver remained unchanged, the difference in potential, hence the driving power, would be correspondingly less.

All these conceptions had a practical application in the treatment of shock. For the last two years treatment of patients in their clinic had been based upon the suppositions that the difference in potential between the nucleus and the cytoplasm of the cells, as well as between the essential organs of the electro-chemical system, must be maintained. The following had been their main principles:

1. The organism needs an abundant supply of water.
2. An abundant supply of oxygen must be delivered to the cells.
3. The permeability of the selective semi-permeable membrane must be maintained within normal range.
4. Both the local and general temperature of the body must be kept at or near normal.
5. An abundance of mental and physical rest and an abundance of sleep are essential.
6. The physical structure of the cells must not be impaired by the indirect effects of the trauma of the operation nor by the anaesthetic.

Every patient should be treated individually. The practical application of the above principles was thus achieved. In "bad risk" cases nitrous oxide-oxygen analgesia (not anaesthesia) was employed together with local anaesthesia. The trauma of the operation was divided. In cases of hyperthyroidism, if the operation produced an exacerbation of the symptoms the operation was stopped at any point, the wound packed open with flavine or sterile gauze, and closure delayed. Water was urged by every route, and to ensure the readiest possible hydration of the cells 3,000 c.cm. were routinely given by hypodermoclysis by Bartlett's method. Oxygenation of the cells was promoted by the transfusion of whole blood before operation, during operation, and after operation, according to the indication. To assure the maintenance of an adequate circulation—which was essential to the supply of water and oxygen to the cells, digitalis was administered as a routine in those cases in which the myocardium was impaired, a condition most commonly seen in cases of hyperthyroidism. Rest and sleep were promoted by control of the environment and by narcotics, except in the presence of an already depressed liver function, as in jaundice, for the function of both the brain and the liver was depressed by narcotics, especially by morphine. In abdominal cases moist hot packs were applied immediately after operation for the support of the liver cells. The environment of the patient was controlled from his entrance to his exit from the hospital. With the gradual extension of the application of these measures based upon the electro-chemical conception the mortality rate of every type of case had been diminished, and the operability had been extended until now no case was considered inoperable unless the stage of final dissolution was initiated.

Dr. MOCQUOT (Paris), speaking also for Dr. Quénu and Duval, gave in addition to the recognized type a description of a type of mitigated shock, often met with in ordinary surgery, caused, like the former, by attrition of the tissues, and which required to be dealt with by means of similar therapeutic treatment; it outlined a new chapter in surgical pathology. The prognosis of traumatic shock might be calculated by the central temperature, the analysis of the arterial tension, and by the analysis of the urine and the blood. The recovery of the urinary function, a discharge of urea and the diminution of azotaemia were the best signs of a favourable prognosis. The therapeutic treatment included prophylactic measures and the treatment of the shock when such had been ascertained to exist. Prompt medical and surgical treatment was a *sine qua non* of prophylactic care. The best surgical treatment consisted in the excision of the wound; immunization by means of an anti-shock serum had not yet given proofs of its efficiency, at least from a clinical point of view. The treatment of an ascertained case of shock might be either symptomatic or causal. The former was especially useful as a means of first aid. Causal treatment was founded on the new notion of the shock. The shock was an intoxication the seat of which was the traumatic lesion; it was consequently there that their efforts were required. Theoretically, what was required was the excision of the wound where the noxious albumins had their rise. Practically they were confronted with two sets of circumstances, according as the limb affected should or should not be amputated. In the latter case they should have recourse to amputation. In the former case the treatment should consist of a thorough excision of the wound, and the devitalized parts should be cut off as far as possible; in any case, the seat of the malady should be thoroughly cleansed. The future progress of the wounded subject depended principally on prompt treatment. A few technical details should be emphasized: The operation should be as quick and simple as possible. The wound should be sprinkled with a hypertonic solution, and no attempt should be made, in the beginning, to bring the edges of the wound together. The choice of the anaesthesia and the anaesthetic had not yet been settled, and required that further researches should be undertaken.

Mr. FRASER of Edinburgh divided our knowledge on the subject of shock into two periods: (*a*) to the end of 1915, and (*b*) subsequent to 1915. During the first period many theories as to its cause had been propounded. Crile and Mummery argued that sensory stimuli produced a rise in blood pressure from the irritation of "pressor" nerves, and that finally the vasomotor system became exhausted. Then followed dilatation of the peripheral vessels and a fall of blood pressure. But it had been demonstrated that the vessels in shock were contracted, and that even in the profoundest shock the vasomotor centres were not exhausted. Yandell Henderson, in his acapnia theory, assumed the sequence: hyperpnoea, acapnia, failure of the vasomotor pressor mechanism, fall of blood pressure, and possibly a secondary concentration of the blood (oligaemia). Boise regarded the fall of blood pressure as being secondary to a cardiac condition, and Meltzer believed that the stimulus of injury resulted in an inhibition of the functions of the spinal cord. The second period of investigation coincided with the European war. Mr. Fraser's definition of shock was "a state of depression of all the vital functions of the body, the state being primarily induced by the infliction of injury on the body tissues and being characterized by a progressive fall of the blood pressure." He then gave a graphic picture of the well known clinical condition. The problem was to explain the progressive fall of blood pressure. Other symptoms were secondary to this. In health there were three factors maintaining the blood pressure—the heart, the vasomotor mechanism, and the blood stream. There was no interference with the nervous mechanism of the heart even in profound shock, and Mann had shown that apart from myocardial disease an efficient contraction of cardiac muscle could be guaranteed so long

as the heart was properly supplied with blood. With regard to the vasomotor mechanism, Malcolm and others had asserted that the vessels were actually contracted during shock. All evidence supported this probability. Many, however, had shown that when shock was established the blood volume in active circulation was reduced. But why was it reduced? Cannon had called it "the problem of the lost blood." Where was it—in the splanchnic area or the capillaries? The practical surgeon said that it was not in the splanchnic vessels, which he knew were contracted during deep shock. In this condition the capillary blood count might exceed the venous by 2,000,000 corpuscles per cubic millimetre. There was therefore a capillary stagnation of the blood. Respiratory, motor, and sensory disturbances during shock were all accounted for by the low arterial pressure. Nervous causes, the influence of the absorption of toxic products, cold, the internal secretions, anaesthesia, haemorrhage, and sepsis, all might play their part in producing this condition. From whatever cause the lowering of the blood pressure came the effect of the change was to set in motion a series of events ultimately leading to a derangement of the body metabolism. There was necessarily a deficient oxygenation of the body tissues and a low capillary stasis. Here a vicious circle began, for capillary stasis resulted in a deficient oxygenation of the tissues, while this in turn aggravated the capillary delay, and it was an obvious consequence that a further fall of blood pressure should result. There followed, as a symptom of a deficient capillary circulation, a fall of the alkali reserve of the blood. Treatment should follow well known lines. The possibility of haemorrhage and sepsis simulating true shock should not be forgotten; the patient must be kept warm. Fluid would help to maintain the blood pressure. Sleep was all-important, though the extent to which morphine should be pushed was very debatable. Adrenaline, strychnine, alcohol, and pituitary extract were of little if any use. Digitalis and camphor were useful as temporary stimulants; oxygen should be given if there was cyanosis; it also relieved restlessness and air-hunger. Glucose and sodium bicarbonate were of value if acidosis was present. Transfusion of blood was excellent, of colloidal solutions useful, but the value of saline solutions was probably very small. Based upon the researches of Abel, Rous, and Turner, the injection of blood corpuscles preserved in a citrate-dextrin solution might be employed. This solution could be kept on ice as long as three weeks. Results so far had been encouraging.

Dr. Victor Pauchet of Paris said that the transfusion of pure blood was on physiological grounds superior to the transfusion of citrated blood. But the latter was easier to perform and could in consequence be more widely applied. The blood was obtained from the donor in an atmosphere of oxygen, and thus venous became transformed into arterial blood, whose action was especially efficacious in the treatment of shock. Its injection after the method of Bécart was a most excellent weapon against the pathological effects of the condition. By it there resulted a rise of blood pressure not tending to subside as after normal saline injections. Blood, moreover, unlike saline, did not filter through the capillary walls. By it also acidosis was neutralized and oxygen carried to the central nervous system and the endocrine glands. The transfusion of citrated blood was already a wonderful discovery, and he considered that the transfusion of pure oxygenated blood was a further improvement. The reason why blood transfusion, the ideal treatment for shock, had not been more widely used was due to the lack of systematic organization in most hospitals. Every unit—surgical, gynaecological, or medical—ought to be provided with a special service, with trained attendants and latest instrumentation, so that blood transfusion could be as easily carried out as the injection of normal saline.

Dr. Uffreduzzi (Turin), Dr. Jiraseck (Prague), and Dr. Mayer (Brussels) also spoke briefly.

PITUITARY SURGERY BY A NEW METHOD.

Mr. A. K. Henry read a paper on a new method in pituitary surgery. He showed an instrument which he had devised, which, used in conjunction with intermittent radiographic control, allowed the pituitary fossa to be entered with mathematical precision by the trans-sphenoidal route. The instrument consisted of the following parts: Two intranasal bars lay one on either side of the nasal septum. These bars bent vertically down in front of the lips and carried a pivoted rod with a terminal cap which entered the mouth. This cap, protected by rubber, pressed against the hard palate, when a screw approximated the rod to the vertical bars; this kept the instrument fixed and stable. He was indebted for this effective device to Dr. Dorothy K. Milne-Henry.

To the vertical rods were attached two plates, and between them was pivoted a tube which could be aimed at the pituitary by means of a screw. The squared end of the tube carried a vernier which travelled over a scale attached to one of the plates and enabled the inclination of the tube to be accurately adjusted. The aim was controlled and corrected by radiography. Resection of the nasal septum allowed instruments to be introduced submucously to the face of the sphenoidal sinus. The method admitted the use of any manipulation which could be carried out through a tube, and instruments resembling those used with an operating cystoscope were available. It was a simple matter to leave a radium tube within the sella. The use of the instrument removed the difficulties which made the trans-sphenoidal route formidable. Earlier diagnosis would still further increase its utility.

His first experience with the instrument in the living after a year's experimental work on the cadaver was not, however, in a case of pituitary disease, but in an operation for sphenoidal sinusitis, performed with Mr. J. Stafford Johnson, in which it gave excellent results. He had since used it in two operations upon a case of hypopituitarism with irregular hemianopia, followed by blindness, in which radiography appeared to show a greatly enlarged sella.

At the first operation a part of the pituitary was removed easily, and without any incident except the occurrence of a polyuria of 5 litres daily for three days. Six weeks later, as the blindness was unrelieved, a second operation was performed, and a second moiety of gland was removed. This intervention was followed by death in eight hours.

Autopsy revealed the fact that the hypopituitarism was due to an occlusion of the aqueduct of Sylvius causing hydrocephalus, and giving rise to a rarefaction of the bones, which, in the radiograph, had simulated a deep excavation of the sella. Only a very small fragment of pituitary substance remained. Death was due to diffuse choroidal haemorrhage caused by the sudden relief of pressure following a small tear in the third ventricle, which had bulged down into the almost empty sella. This tear gave rise to a gush of cerebro-spinal fluid, which, at the time, was thought to come from a cyst. These operations were performed before ventriculography became current practice.

The point emphasized was that at the first operation the greater part of a small compressed gland, offering an exceptionally small mark for the instrument, was removed without ill result.

Failure in this case was due to the diagnosis, and not to the instrument. The opening made by it was as precisely accurate as if drilled from within under direct vision.

In conclusion he cited the following passage: "We have sacrificed opportunities of progress in the anatomy, physiology, and surgery of the brain by too ready acquiescence in the assumption that we must remain dependent on the visual sense for every species of intracranial operation."

THE second International Congress of Urology will be held in Rome from April 23rd to 27th, 1924, when the following subjects will be discussed: Renal innervation, introduced by Dr. Ambard of Strasbourg, Professor J. S. B. Stopford and Mr. J. B. McAlpine of Manchester, and Dr. Zoia of Pavia; vaccine treatment of urinary diseases, introduced by Drs. Rovsing and Wulff of Copenhagen, Dr. L. S. Dudgeon of London, Dr. Noguès of Paris, and Dr. Pirondini of Rome; remote sequelae of operations for renal calculus, introduced by Drs. Brongersma of Amsterdam, Cifuentes of Madrid, and Tardo of Palermo; recent progress in urology. The last subject has been proposed by the British and American delegates, but the speakers have not yet been selected. Further information can be obtained from the general secretary, Professor A. L. Bonanome, via dei Gracchi, 124, Rome.

British Medical Journal.

SATURDAY, AUGUST 4TH, 1923.

THE PORTSMOUTH MEETING.

The ninety-first Annual Meeting of the British Medical Association, held last week at the great seaport town of Portsmouth, has played a notable part in forwarding the three chief aims for which the Association exists—namely, to promote the medical sciences, to maintain the honour and interests of the profession, and to foster a feeling of friendship among its members. From each of these points of view—the clinical and scientific, the medico-political, and the social—the Portsmouth meeting was highly successful. It will be remembered by all who took part in it for the practical tone of the discussions in the Sections; for the business-like spirit in which the Representative Body carried through its long programme; and, perhaps most of all, for the abounding hospitality extended by the Portsmouth Division of the Association, by the Mayor and Corporation, by the Naval authorities, and by residents in the town and neighbourhood, both medical and lay. This gathering of more than a thousand medical men and women from all parts of the British Empire demonstrated something of the power wielded by the British Medical Association in consolidating members of the profession for their own good and in the public interest. Everyone who heard the President's address and followed the work of the meeting must have been impressed both with the universality of Medicine, and with the closeness of its contact with educated lay opinion in all that affects the welfare of the community. The growing public interest in medical matters was reflected in the zeal with which the proceedings of the Representative Body and the Sections were followed by the lay newspapers, and gave point to Mr. Childe's dictum from the Presidential chair that "the advent of a wide-awake and informed public tends to keep the profession up to the mark."

The scientific and clinical work of the meeting lost nothing in interest or value from a reduction in the number of Sections; they were 16 this year as against 19 at Glasgow. In another column we begin the publication of summaries indicating the scope of their work, in anticipation of the full reports to be published in subsequent issues. The attendance at most of the Sections was good, and interest was well maintained throughout. The discussion on diabetes, in the Section of Medicine, attracted a very large audience to pay honour to Dr. Banting of Toronto, and hear from his own lips some account of his discovery of insulin, and learn the latest news of its application to clinical practice. Another big gathering was that in the Section of Obstetrics and Gynaecology on July 26th, when Mr. Comyns Berkeley opened a spirited debate on the use and abuse of forceps. To illustrate further the unacademic nature of the sectional work this year, and its interest for the general practitioner, we may mention the discussions on the etiology and treatment of heart disease in early life, and on chronic bronchitis, in the Section of Medicine; Dr. Cameron's attractive introduction to a discussion on the nervous child; the surgical symposium on how to treat acute primary affections of the hand; and the debate by the pediatrists on summer diarrhoea. The pathological proceedings showed no aloofness from clinical medicine; and the public health officers—like the radiologists, the orthopaedic surgeons, and the experts in venereal disease—considered in their several Sections topics of interest to others than specialists. The anaesthetic discussions, both in the special Section and in the Section of Surgery, were eminently practical, and the same can be said for the excellent debate on ophthalmology in its relation to the Army, Navy, and Air Force, which brought together civilian ophthalmic surgeons and many medical officers from the three services.

In the premier naval port special attention was naturally given to the Section of Naval and Military Hygiene, in which papers were read by prominent officers, and several demonstrations were given of great interest to all members of the profession, and particularly to those in the services. The Sections were not organized on any fixed pattern. Thus while the oto-rhino-laryngologists had a very varied programme, the Section of Tuberculosis focused attention on three problems, and the medical sociologists concentrated upon three aspects of a single topic. Lastly, in connexion with the scientific work done at Portsmouth, a word of praise is due to the organizers of the Pathological Museum.

The four days preceding the sectional meetings were devoted, as usual, to the transaction of medico-political business by the Representative Body and to discussion of the domestic affairs of the Association. A feature of these meetings in recent times has been the growing number of delegates from Oversea Branches, and it is pleasant to be able to record that this year their number was greater than ever before. A full report of the first three days' work of the Representative Body appeared in last week's Supplement, and the concluding day is reported in the same detail this week. From these accounts and from the outline sketches published last week in the Journal at page 151, and this week at page 198, it will be seen that the programme, though long and intricate, was completed with great expedition under the able chairmanship of Dr. Wallace Henry. Of the controversial matters discussed at full length, mention must be made here of the scheme for closer co-operation between the British Medical Association and the Society of Medical Officers of Health, which was adopted by a large majority after every objection had been heard; and the hospitals debate, which ended in putting off for another year a solution of the "staff funds" problem. On the first subject a working agreement has been reached; on the second, professional opinion is still sharply divided. The outstanding domestic event brought before the Representative Body was the recent acquisition of a new headquarters building for the Association in order to keep pace with its growth in membership and activity. The action taken in this matter by the responsible officers was heartily endorsed by a unanimous vote. For information on this and many other topics of professional interest members must turn to the very full reports in the Supplement and the running commentaries in the Journal.

As we have indicated already, this year's Annual Meeting was notable for the success of its social side. The hospitality of Portsmouth and Southsea, and their neighbours, was lavish. The President and the indefatigable Local Honorary Secretary, Mr. Scott Ridout, and their many willing colleagues devoted themselves heart and soul to make the meeting not

merely an instructive medical conference, but a series of charming entertainments. Chief among the evening functions were the President's reception on Tuesday, the Mayor's reception on Wednesday, the Divisional reception on Thursday, and the Mayor's ball on Friday. The hours of daylight were equally full of festivity for those who could tear themselves away from sterner business. Each day had its programme of garden parties or visits of inspection to naval establishments and kindred objects of interest, while on Saturday no fewer than seven separate excursions were in progress. For the excellence and variety of these many trips the Association owes a debt of gratitude to its hosts. Some acknowledgement to those who co-operated so generously in entertaining members and their womenfolk during the week was made at the Annual Dinner and at the end of the Representative Meeting, as recorded in the SUPPLEMENT at pages 81 and 84. Further appreciation of individual hospitality and service is offered in a note on the excursions at page 87. From all quarters we have heard praise for the local arrangements.

THE HORMONE OF THE PANCREAS: INSULIN.

THE numerous questions raised by the isolation of insulin were discussed both in the Section of Medicine at the Annual Meeting of the British Medical Association and at the International Physiological Congress at Edinburgh. The latter body, whose members are more accustomed to lecture than to listen to lectures, gave up its first session to Professor Macleod, who reviewed the present situation in the lecture printed in full this week (p. 165). He began by relating the story of the earlier attempts to obtain the hormone of the pancreas; it is not only an interesting chapter in the history of physiology, but it is helpful to the practitioner of medicine by the strong impression it produces of the special characters of this hormone, its delicacy, and its potency.

The two great merits of the researches carried on at Toronto seem to us to be, first, the courage and enterprise shown by Dr. Banting in attacking the subject again. He took advantage of an old observation that obstruction of the ducts of the pancreas was followed by degeneration of the cells of the acini by which the pancreatic juice is secreted, while the islets of Langerhans remained little if at all affected. Physiologists had long been confident that the pancreas produced a hormone, and that it was formed in the islets of Langerhans; so confident indeed were they that Sir E. Sharpey Schafer suggested the name "insulin" for the hormone. The difficulty was that when an extract of the whole pancreas was made the hormone was destroyed by the trypsin-producing cells. Many physiologists attempted to overcome this difficulty, but they were not able to obtain convincing evidence that an antidiabetic hormone did actually exist in the pancreas. It is to the enduring credit of Banting and Best that by experiments of a different type from those of their predecessors they established its existence. The other great merit of the Toronto experimenters was, we take it, that they unravelled the meaning of the convulsions which ensue in an animal rendered diabetic by excision of the pancreas when insulin is injected. Several earlier experimenters seem to have been on the verge of the discovery of insulin, but were deflected by the occurrence of symptoms considered to be toxic but which it is now seen were probably due to hypoglycaemia. The Toronto observations showed that convulsions are in fact produced by a deficiency of sugar in the blood, and can be arrested by the injection of glucose; apparently the brain cannot function without a sufficient amount of sugar in the blood which reaches it.

Knowledge of the way in which insulin produces a lowering of the sugar in the blood, both in health and in diabetes, is as yet imperfect. It seems to have been conclusively established by animal experiments that insulin does not stimulate the destruction of sugar within the blood itself. Its action is extravascular, and it seems probable that it produces, so to say, a kind of hunger of the tissue cells, which pick out the sugar in the blood. In this connexion it must be remembered that insulin has an important action on the metabolism of fat in diabetic animals. Lipaemia may occur in advanced diabetes as well as acetonuria, and in a dog removal of the pancreas is followed by the presence of excessive quantities of fat in the blood and the liver. In some way the migration of fat in the body becomes abnormal, and its final oxidation is seriously interfered with. When insulin is given to the animal acetonuria very promptly disappears, the blood fat apparently more slowly. As the amount of fat declines that of glycogen in the liver increases; that is to say, there is a movement towards normal.

Again, the history of the subject makes it improbable that one of the questions asked by Sir Thomas Horder in opening the discussion on insulin in the Section of Medicine at Portsmouth can ever be answered in the affirmative. His question was whether it is likely that it will become possible to administer insulin by the mouth. It was the destruction of the hormone by the trypsin secreted by the gland that stood in the way of the earlier experimenters, and it is now known that insulin is also destroyed by pepsin. The chemical constitution of insulin is, however, not yet known. The fact that it is destroyed by pepsin and trypsin seems to make it probable that it is in the nature of an albumose, but Professor Macleod suggests as a possibility that it is really only adherent to this protein and itself has a much simpler chemical structure. Another question asked by Sir Thomas Horder was whether there was any hope of recovery of the pancreas in diabetics. While admitting that nothing definite can yet be said on the point whether continued treatment with insulin will enable the diabetic patient to recover any of his lost power of producing internal secretion in his own pancreas, Professor Macleod mentioned the observation that islet tissue develops considerable powers of regeneration after much of it has been destroyed as a result of ligation of the secreting ducts of the gland. In the course of the discussion at Portsmouth Dr. E. P. Poulton made a rather encouraging statement, as he had observed some increased toleration in three out of four mild cases.

As to the exact value of insulin in the everyday treatment of diabetes, it is yet too soon to speak. There is a general consensus of opinion that it produces an immediate and dramatic effect in diabetic coma, and that the patient's symptoms may afterwards be held in control by suitable dieting. As to whether it is necessary to use insulin in mild cases opinion is yet very far from being settled. Professor Macleod probably expressed the present position well when he said that as an adjunct to therapeutic control treatment with insulin greatly improves the nutritive condition and increases the resistance towards infections, a complication to which diabetic patients are particularly prone.

We may conclude this brief survey of the information about insulin contained in this issue of the JOURNAL by echoing two of Professor Macleod's observations. The one is that without experiments on animals we should not now be in possession of the knowledge of the mode of action of insulin which justifies its confident use in the treatment of severe cases of diabetes in man, and in particular of its great value in diabetic coma. Until the laboratory investigations had furnished perfectly definite results serious attempts to carry the investigations into the clinic could not be made. The second is the credit he justly gives to those responsible for producing insulin on a large scale for clinical use, that they should have succeeded in so short a time in their work.

TEACHING OF OPHTHALMOLOGY.

IN the correspondence with the General Medical Council printed last week (p. 147) the Council of British Ophthalmologists takes up once more its parable of 1919 and urges that no student should be considered to have passed the qualifying examination unless he has shown a sound knowledge of practical ophthalmology in an examination conducted by ophthalmic surgeons. Its position has been fortified by the recommendation of the Departmental Committee on the Causes and Prevention of Blindness, inviting the General Medical Council "to insist that every student presenting himself for a qualifying examination in medicine should be examined in ophthalmology." The Departmental Committee found fault with the limited amount of training in the subject which students receive, and pointed out that as a general rule the examining body does not require a candidate for a degree or a diploma to be examined in ophthalmology. It will be remembered that the General Medical Council took limited action in 1919 by requiring that every student should attend a course of practical instruction in ophthalmology of not less than ten weeks' duration, and that his schedule should not be signed unless his work in connexion therewith has reached a satisfactory standard. The ophthalmologists object to this that it leaves it entirely to the ophthalmic surgeon to determine what the evidence of satisfactory work in his department shall be. At the meeting of the General Medical Council on June 1st the Chairman of the Examination Committee drew attention to the report of the Departmental Committee, and also mentioned the letter from the ophthalmologists. The Council decided to inform the Ministry of Health that one of the recommendations made by the Council last year to the licensing bodies for the improvement of the medical curriculum was that each student should receive instruction in diseases of the eye, refraction, and the use of the ophthalmoscope, and the Council of British Ophthalmologists that it was too soon to judge of the effect of the recommendations to the licensing bodies. It is of course very true that the curriculum is overloaded, and that the student of to-day has to undertake far more classes than was the case even twenty years ago; if students know that they will not be examined in a special subject they cannot be expected to give much attention to it; they will gamble to a certain extent with this and with other special subjects. Ophthalmology, however, is intimately bound up with general medicine and surgery, and there should be no great difficulty in the student finding time to attend the required course of lectures and practical instruction in the wards and out-patient department in the time at his disposal. The experience of the Irish examining bodies has shown that there is no particular difficulty in conducting an examination in ophthalmology as part of the final examination. The sense of sight is of such paramount importance to man that the present state of affairs cannot be regarded as satisfactory, and yet it is hard to blame the General Medical Council for not at once instituting a special ophthalmological examination as part of the final qualifying examination. Such an examination must be conducted by ophthalmic surgeons, and so many years have passed since general surgeons were also ophthalmic surgeons that few, if any, of the members of a court of examiners at the present time have the necessary knowledge of diseases of the eye to conduct such an examination. Any examination, however, should be simple in type and of a clinical character.

THE HEALTH OF LONDON.

THE London County Council, like other public authorities in these days of retrenchment, cuts down rigorously its output of paper and printing, including annual and other reports. Its Public Health Report for 1922[1] contains in 130 octavo pages the report of the County Medical Officer and School Medical Officer, and the report on main drainage and housing. In an introductory note Sir William Hamer refers to some of the salient facts in the health history of the year. There was a heavy prevalence of infectious diseases—influenza, measles, whooping-cough, scarlet fever, and diphtheria—in the early months, but summer diarrhoea was checked by the wet cool summer and the activities of child welfare centres and other agencies, so that the rate of mortality from that cause under one year of age was unprecedentedly low—6.26 per 1,000 births, as against 18.63 in the previous year, and 24.28 in the four years 1911-14. As a result of this the all-age death rate was 13.5, or only 1 per 1,000 above the record minimum of the previous year. Of typhoid fever there were only 264 notifications—the very minimum for London—and 1922 has been the eleventh year in succession with almost complete absence of an autumnal rise in the curve of prevalence. This leads Sir William Hamer to review the whole question of typhoid incidence. As in cholera in the past, cases of typhoid tend to occur in groups, sometimes in circumscribed areas or in institutions, and, as pointed out in a previous report (1911), such groups commonly occur in streets occupied by families living in poverty, but not in extreme poverty. Two theories have been advanced in explanation—one that of healthy carriers, the other, not infection from person to person, but the continued operation of a common cause. The latter is the hypothesis adopted in the report, and the common cause is food supply, the food responsible being immature flat-fish. That thesis is defended in most interesting fashion in the body of the report, but in the present brief paragraph we are dealing only with the introductory note. Turning to phthisis, it is observed that there has been some increase in the registered death rate at young adult ages, but this is attributed to the debiting (Sir William says crediting) to London of deaths which would formerly have been registered in health resorts or abroad. The United States policy of limiting immigration has had in respect of health an indirectly favourable influence in this country, through which many emigrants, some developing acute infectious disease, used to pass on their way to America. In 1922 administrative progress has been made in tuberculosis and venereal disease treatment schemes. A February census of homeless persons showed a great reduction as compared with pre-war years, and the same remark applies to occupants of common lodging houses and furnished rooms. Similarly the census of 1921 showed some diminution in overcrowding. We hope in a later notice to deal more fully with some parts of the report.

[1] Annual Report of London County Council, vol. iii. Public Health. P. S. King and Son. 1923. Price 2s. 6d.

SEGREGATION OR AGGREGATION?

The Ministry of Health has issued a very useful report[1] by Dr. J. R. Hutchinson in which the important question of the influence of hospital overcrowding on the occurrence of return cases and the spread of cross infection is discussed. The report also raises incidentally the question of the relation between scarlet fever and diphtheria. It appears that the Abingdon Isolation Hospital was well planned, and had, on the Ministry's standard, accommodation for 46 patients, which was ample for the needs of the borough and rural district. From time to time, however, agreements were entered into for taking patients from other districts, and on visiting the hospital Dr. Hutchinson found 124 beds and 120 patients. This overcrowding had existed for a considerable period, and at one time there were as many as 138 patients. The total population attempted to be served was 110,000. One of the areas is the Ramsbury rural district, and here it appears that as a matter of routine all cases of scarlet fever and diphtheria are removed to hospital at the instance of the notifying practitioner. Through admission and discharge of patients the Ramsbury district and the hospital were thus in frequent association, and the position of Ramsbury village as to disease prevalence is notable. For several years prior to 1922 the district had been almost completely free from scarlet fever and diphtheria, but in that year there were 91 cases, of which 79 were in the village; there were 57 cases of scarlet fever, and 19 of diphtheria; in 3 cases both infections were present simultaneously. In 17 houses a total of 60 cases occurred, 46 of them in 10 houses. The length of time over which the cases were spread and the change of infection in a house from scarlet fever to diphtheria pointed to reintroduction from without. This view is strongly supported by a detailed analysis of various groups of cases. In the Abingdon borough and rural district the practice was similar, and there was similarity in the effects. On the other hand, in the West Berkshire combined districts, comprising 70 per cent. of the total population served by the hospital, only a minimum of cases were sent to it, home treatment being adopted wherever practicable. The case rates per 1,000 of population in the three areas are significant. For scarlet fever Ramsbury rural district had a rate of 9.7, Abingdon borough and rural district 18.5, and West Berkshire only 3.0. For diphtheria the corresponding rates per 1,000 population were 1.7, 2.1, and 1.0. It is impossible to disagree with Sir George Newman's prefatory note, in which he says it would be far better in many cases to treat the patients at home than to submit them to risks of cross infection and damaging sequelae. In short, we may summarize the lesson of the report by the title of this note. If a hospital is overcrowded, its patients are not segregated but aggregated, and even though the cubic space per case may still be greater in the hospital than at the child's own home, yet in the former the risks of cross infection may much more than counterbalance the advantages of the extra cubic space. This should always be borne in mind in the administration of a hospital for infectious disease, especially if it possesses no isolation block composed of multiple cubicles entirely separated from each other, for treatment of doubtful or mixed infections.

[1] Report by Dr. J. R. Hutchinson on the Incidence of Scarlet Fever and of Diphtheria in 1922 in the village of Ramsbury, etc. London: H.M. Stationery Office. 1923. Pp. 28. 9d. net.

THE UNIFICATION OF PHARMACOPOEIAL PREPARATIONS.

This year's meeting in London of the International Pharmaceutical Federation was arranged to coincide with the diamond jubilee session of the British Pharmaceutical Conference, held last week at Great Central Hotel, Marylebone. The Federation represents twenty countries, and delegates from France, Italy, Spain, Belgium, Holland, Roumania, Greece, Australia, South Africa, the United States, Czecho-Slovakia, and other nations were present. The president, Professor van Itallie, dean of the University of Leyden, devoted a large part of his inaugural address to the problem of an international pharmacopoiea. He pointed out that in these days of increased traffic between countries the absence of uniform standards in medicine is an anachronism. As president of the committee for the pharmacopoiea of Netherlands he realized the amount of work connected with its periodical revision, and advised that a central international bureau should be formed to do the work of revision for all pharmacopoieas. In this way we should arrive at uniformity at least in the case of the more important drugs and their preparations. Dr. J. J. Hofman (Holland) said that the Belgian Government, which had brought together the Brussels Conference on Potent Drugs of 1902—a conference which resulted in the valuable international agreement of 1906—had been asked to approach the other governments in order to convene another conference which should decide on the formation of an international pharmacopoeial bureau as outlined by Professor van Itallie. No answer had as yet been obtained from the Belgian Government, and if unfavourable another Government could be found to take the matter in hand. Mr. V. Cofman (Roumania), in a communication dealing with the same subject (the international uniformity of medicinal preparations), suggested a different way of attacking the problem. He presented to the conference, in collaboration with other members, a number of monographs on several important drugs—for example, those on opium by H. B. Stevens, on cinchona by C. T. Bennett, and on belladonna by A. J. Jones. Each of these monographs dealt with its subject in an exhaustive manner, giving comparative tables of the formulae and strengths in all existing pharmacopoeias, and a reasoned criticism of the various methods in use. It was suggested that this preliminary work of documentation should be continued in the faculties of medicine and pharmacy of every country, and, when all the information necessary for unification had been obtained, a conference of medical men, pharmacists, and analysts should meet under the auspices of the Health Department of the League of Nations and decide which formulae and methods could be universally adopted. This proposal will be considered by the permanent bureau of the Federation. Several other matters of interest were discussed. Dr. C. Rousseau (France) presented a thorough report on pharmacopoeial nomenclature, showing the dangerous confusion which exists at present, the same product being in certain cases known officially—in seventeen countries—under fourteen different names. The seriousness of the situation is indicated by the fact that the official name for calomel in Belgium is hydrarg. praecip. alb., and that the tinct. camph. co. of the Portuguese pharmacopoeia is a liniment containing twenty times as much opium as its British synonym. Other reports dealt with patent medicines and with recent legislation on dangerous drugs which, though arrived at by international agreement through the intermediary of the League of Nations, still shows variations from one country to another. The clause which places the responsibility of dispensing a forged prescription on the shoulders of pharmacists was criticized, and various resolutions on matters of pharmaceutical interest were passed.

BRITISH GUIANA MEDICAL SERVICE.

In August, 1922, the Governor of British Guiana appointed a committee "to consider and report as to what best could be done to place the medical services of the colony on a satisfactory and permanent basis." The committee held its first meeting in August, 1922, and reported in

November, after inquiring into "the conditions of service in all branches of the Medical Department." The report now issued[1] will materially affect the development of the medical services, and is of considerable interest. As regards medical officers, whilst some inequalities and anomalies are recognized in connexion with allowances and fees, no change is suggested, and the existing salary scales of £500 to £600 for second and £600 to £700 for first grade officers are considered satisfactory. Certain changes are recommended in the distribution of districts, and also (on the plea of economy) the abolition of the Demerara River medical officership. The importance of a qualification in tropical medicine is emphasized, and it is suggested that a recognized degree or diploma in this subject should in the future be required from candidates for appointment, whilst any member of the service not holding such a qualification should acquire it during his next period of leave, or as a preliminary to promotion to Grade I. Payment of class fees and an extension of two months' leave on full pay are recommended in the case of applicants for study leave approved by the Surgeon-General. This concession means, of course, that the officer concerned must devote to the course selected the four months' leave to which he must be entitled at the time of application, in addition to the two months' extension. It is also subject to an undertaking to refund all amounts received under this head in case of failure to return to the colony on completion of the course, or to remain in the service for at least two years from that time. Considerable extensions of the public hospital at Georgetown are recommended, and a scheme is put forward for the appointment to the hospital staff of specialists in eyes, nose, throat and ear, venereal diseases, and tuberculosis; the first of these appointments—that to the eye department—to be made at once, on a scale of £700 rising by yearly increments of £50 to £900 per annum, with free quarters or house allowance; the others as finances permit. The report also provides for the appointment of a non-medical radiographer, to relieve the bacteriologist of the duties he at present discharges in the *x*-ray department. It is suggested that the fees earned by this increased staff should materially relieve the revenue. In the Public Health Department it is recommended that medical officers of health acting as port medical officers should be permitted to charge and retain overtime fees for work done between 6 p.m. and 8 a.m. Finally, it is laid down that all future appointments to the medical service should cover the duties of medical officer to the Baby Saving League and service at the league centres. The report also covers the nurses' and dispensers' departments.

[1] Report of a committee appointed by his Excellency the Governor, to consider and report on the medical services of the Colony. Combined Court, No. 28/1922. The Argosy Co., Ltd., printers to the Government of British Guiana.

IRISH MEDICAL SCHOOLS' AND GRADUATES' ASSOCIATION.

THE summer general meeting of the above association was held on July 25th at "The Corner House," Portsmouth. The chair was filled, in the absence of the president (Sir William Taylor, K.B.E., C.B.), by Dr. J. A. Macdonald, vice-president, who congratulated the members present on the exceptionally large attendance, one of those who were with them that day having come all the way from far-off Donegal. The luncheon which took place the same day was graced by the presence of several ladies, and the chairman said he was glad to know that an increasing number of women doctors who had studied in Ireland were joining their ranks. They were thus supporting an association which was the first medical society in England to admit women to membership. In fact, one of the original members was a lady who was still practising in the West of England. The speeches which followed the chairman's were commendably short. The health of Dr. Macdonald was proposed by Mr. Hempson, who said it was refreshing to learn that an association of Irishmen representing every shade of political and religious opinion had been, as the chairman had told them, forty-five years constantly meeting thrice yearly, and that there had never been the whisper of a quarrel all that time. It was evident that the *mens medica* had imbued them with those high ideals of good fellowship for which their profession was noted all the world over. Dr. Douglas, whose health was proposed by Dr. James Stewart, said that their members who cultivated the spirit of camaraderie were rewarded by the pleasure they derived from meeting, after years of perhaps foreign service, old comrades they had not seen since they were students together in Dublin, Belfast, Cork, or Galway. They had much reason to thank an army surgeon (the late Dr. James Thompson) for giving to these men and women the same opportunities that the ex-students of London hospitals enjoyed of periodically renewing old friendships. A very enjoyable reunion was brought to a close by the entire company singing, in the heartiest manner possible, "God Save the King."

A PORTRAIT OF SIR CHARLES SCARBURGH.

THROUGH the generosity of Dr. R. W. Innes Smith of Sheffield a fine portrait in oils of Sir Charles Scarburgh has just come into the possession of the Royal College of Physicians of London. It was known that two portraits of Scarburgh were in existence—one in the Hall of the Barber Surgeons and the other in the collection at Temple Newsome, Whitchurch, Yorks. Lately the collection at Temple Newsome has been dispersed, and Dr. Innes Smith found that the portrait of Sir Charles Scarburgh was for sale. He lost no time in finding the seller, and purchased the portrait; he has now generously presented it to the College of Physicians, where it will be on view shortly. Although this portrait was styled in the sale catalogue the portrait of a "Navigator," on account of mathematical instruments being on the table, Dr. Innes Smith had no difficulty in establishing its identity by comparing it with an engraved portrait of Scarburgh by Van der Gucht. Scarburgh was a distinguished physician in the seventeenth century, and occupied the position of physician to Charles II, James II, and William III. He was deeply interested in mathematics, and was the friend of Harvey, who bequeathed to him his velvet gown and his "little surgical instruments of silver."

NOTIFICATION OF TUBERCULOSIS.

THE Ministry of Health has issued to all medical practitioners in England and Wales a circular letter, dated August 2nd, expressing its concern that more than 40 per cent. of the persons dying from tuberculosis have not previously been notified as suffering from that disease. Under the Public Health (Tuberculosis) Regulations, 1912, it is the duty of every practitioner, within forty-eight hours of his becoming aware that any patient of his is suffering from tuberculosis, to notify the case to the medical officer of health of the district, unless he has reasonable grounds for believing that the case has already been notified to that officer. Attention is called to the fact that the regulations expressly require that every notification and every document relating to a person so notified is to be regarded as confidential by the medical officer of health and every other person who has access to the documents. Further, if the practitioner considers that the circumstances of any particular case are such as to render it unnecessary or contrary to the interests of the patient for his home to be visited by the medical officer of health or his staff, it is open to him to arrange to dispense with such visits. It is of course

important, in the interests of the patient as well as of others, that a diagnosis should be made as early as possible, and under the tuberculosis schemes of local authorities facilities are available for assistance in diagnosis, including the services of the tuberculosis officer for consultation. The object of the regulation is stated to be to make it possible to take steps to prevent the spread of infection, to discover other possible cases among those who have been in contact with the patient, and to ensure that the patient receives to the fullest possible extent the treatment best suited to his condition.

INTERNATIONAL CONGRESS OF OPHTHALMOLOGY.

We announced recently (July 14th, p. 76) that the committee of British ophthalmologists formed to arrange for an international congress of ophthalmology to be held in London, 1925, had decided that it must be postponed on the ground that French and Belgian ophthalmological societies had passed resolutions to the effect that they felt themselves unable to participate in a congress if Germans were admitted. We have now received a letter from the General Secretary of the Société française d'Ophtalmologie stating that the French and Belgian societies fully agree that German, which is used for scientific communications by several nations, should be one of the official languages at the proposed congress in London, and that they are ready to co-operate with ophthalmologists in Austria-Hungary, Bulgaria, and Turkey; but they adhere to their decision not to take part in the congress if Germans are invited to attend. They consider that in taking this course they are acting in accord with the resolutions adopted at the conference arranged in London by the Royal Society in October, 1918. The resolutions then adopted were confirmed by the Conseil International de Recherches held in Brussels in July, 1922. The reasons given on these two occasions still apply, in the opinion of our French and Belgian colleagues, to the attitude assumed by Germany and the German medical profession. From the wording of the communication we gather that French and Belgian ophthalmologists think that the question of holding an international ophthalmological congress in London in 1925 is still open, but we have not received any communication from British ophthalmologists since that published on July 14th.

ROCKEFELLER MEDICAL FELLOWSHIPS.

The Medical Research Council announces that it has awarded Rockefeller Medical Fellowships, tenable in the United States of America during the academic year 1923-1924, to John Crighton Bramwell, M.D.Cantab., M.R.C.P., Medical Registrar and Registrar to the Cardiographic Department, Manchester Royal Infirmary; Norman McOmish Dott, M.B., Ch.B.Edin., F.R.C.S.Ed., Assistant in the Physiological Department, University of Edinburgh; Helen Ingleby, M.B., B.S.Lond., M.R.C.P., Assistant Physician Victoria Hospital for Children and South London Hospital for Women; Hugh Kingsley Ward, M.B.Sydney, D.P.H.Oxon., member of the scientific staff of the Medical Research Council working in the Department of Pathology, University of Oxford. Further awards may be made during the coming academic year.

The Dinner in celebration of the hundredth year of the *Lancet* will be held at the Hotel Victoria, Northumberland Avenue, London, W.C., on Thursday, November 29th, 1923, and not, as previously announced, on November 28th. Mr. Neville Chamberlain, the Minister of Health, has signified his intention to be present.

ANNUAL MEETING NOTES.

The Annual Representative Meeting.

The chief business on Tuesday, July 24th, was the reception and approval of the report of the Dominions Committee and of that section of the Organization Report which dealt with Oversea Branches. The grouping of items from the two reports enhanced the effect, which, as usual, was a happy one, and owed much to the cordial expressions of good-will from the several oversea representatives present. Dr. Morton Mackenzie's introduction of the South African section of his report was particularly effective. He succeeded in conveying a very definite impression of the complex and difficult medical position in the Union, and at the same time vindicated the attitude taken by the Council throughout negotiations with the several parties into which the South African profession is unfortunately divided; Dr. Baumann's tribute to his efforts towards agreement was fully justified. For obvious reasons Dr. Baumann himself refrained from comment on the present position. The resolution expressing regret at the unsatisfactory conclusion of the negotiations with the Colonial Office in respect of the Windward Islands Medical Service, and endorsing the Council's action in inserting an Important Notice with regard to appointments in that service, as well as the other steps taken to bring existing conditions to the notice of prospective candidates, was well received. Unfortunately the representative nominated by the Grenada Branch arrived late, but his subsequent speech had the merit of drawing attention to the gravity of any decision which might cut off from a portion of the Empire, for any reason, the supply of British-qualified practitioners. The Representative Body had also to consider reports from the Irish and Scottish Committees, from the Committee on Notification of Venereal Diseases, and from the Non-Panel Committee. A point of interest arose on the report on notification of venereal diseases. No specific recommendation was made by the Committee, and there was danger on the one hand that the public might receive a false impression of the attitude of the profession to so urgent a matter if the report passed without discussion; on the other, that an ill advised resolution might hinder useful development along the lines of the Trevethin report. The Chichester and Worthing motion, as finally amended after discussion, avoided both dangers. Dr. McGregor-Robertson scored a success by his contribution to the satisfactory solution obtained. The conclusion of the business of the meeting by 3 p.m. was an effective witness to its admirable conduct by the Chairman. Altogether the Representative Body may congratulate itself on the expedition with which it disposed of its long four days' agenda.

The Bishop of Winchester's Sermon.

A religious service for the Association, which was largely attended by members, was held at Portsmouth Parish Church (St. Thomas à Becket) on Tuesday afternoon. The service was conducted by the Rev. W. H. David, and included special prayers for the sick, for the medical profession, for nurses, for students, and for medical missions. The sermon was preached by the Bishop of Winchester, who spoke from the words "With reverence and godly fear" (Hebrews xii, 28). He disclaimed any suggestion that he had chosen this subject of reverence because he thought the man of science an irreverent man, proud of his knowledge, and without the fear of God before his eyes. In his mental gallery some of the noblest types of reverence and faith were surgeons and physicians. But he thought that a few words on this subject might perhaps strike the keynote of the Annual Meeting, and send those present into their discussions with a refreshed sense of the value and dignity of

their calling. Reverence was not always paid by looking upwards to the light which no man could approach unto. God was known largely through the things He had made, to which He had imparted light and colour, mystery and beauty, the majesty of order, and the skill of natural processes. The reverent man had reverence, not only for the Creator, but for created things. Here surely was something which belonged to the sphere both of those whom he was addressing and of himself as a minister of the Church. It might well be that those whose task it was to preach reverence were not always themselves the most reverent. Familiarity, habit, and contact with the sordid or merely material aspects of life might deaden reverence in those who should uphold it. Before the medical profession the knowledge of the human body lay open, a machine incomparably finer, more adaptive and resourceful than any possible work of man, with unsounded mysteries of animating life and force, and relations with things which were not material. But, not content with this, the profession made a claim, which the rest of them gladly allowed, to share in that wonderful sphere of which the body was only the arena, or the instrument, or the companion—that inner life of man, with its affections and passions, its delicate reserves, its powers of sacrifice and of patience. All this came before the medical profession as well as before the Church, and in dealing with it the profession could impart that spirit of sympathy and wisdom which was born of true reverence. Those were the more familiar and obvious things, although intensely sacred and important; but he would go on to indicate another region, upon which, however, he could not dwell. The absorbing interest of our time was in the complex interrelation of the physical, mental, and spiritual life. Here there were possibilities to be explored, dangers to make for caution, and vistas to allure. Here was a sphere in which reverence might well find a new call and opportunity. Not by one jot would they abate their allegiance to what had been proved and tested, nor would they allow the sternly won gains of science to be taken from them; but after two or three generations of astounding progress on the material side of life, they would not be surprised or displeased that there should be some fresh disclosure of the part which mind—and, beyond and through mind, that which they called spirit—could play. If God worked through material things, how much more closely could He work through the higher efforts of man's mind, his rare imaginings, his courage and moral struggle! In conclusion the Bishop bade his hearers have no jealousy of the things of the spirit, but work for the alliance of spiritual power with their own splendid physical resources. Then they would find in the sphere of their own labour fresh evidence of the God in whom existence had its centre, its animating life, and, in spite of all its mysteries, its intelligible meaning.

THE POPULAR LECTURE.

THE Popular Lecture was delivered on Friday evening in the Examination Hall of the Municipal College by Dr. W. E. Elliot, M.C., M.P., Parliamentary Under Secretary of Health for Scotland, whose subject was "Food and health." Those present were treated to an interesting exposition of some principles of dietetics, and carried away some good advice, the chief of which was perhaps, in the words of the old music-hall song, "A little bit of what you fancy does you good." Captain Elliot took his audience on some pleasant excursions into the realms of fantasy to bring home to them the wonders of the process of assimilation. Here were various substances used as foods, widely different from one another in their origin and composition, and all of them alien in structure from the flesh of human beings, yet when taken into the body they were convertible into human tissue. If a man could breathe upon a pork chop so that it rose up and became Plato the world would acclaim a miracle. But what actually took place during digestion and assimilation was scarcely less miraculous. It was as wonderful as if a wizard were to turn the chairs and tables on the platform into members of Parliament. Assimilation, one of the key factors in living matter, was still a mysterious thing; so much so indeed that students of dietetics were constantly driven to explain it by the invention of new hypothetical substances which nobody had seen or isolated. He noticed that vitamins had now reached the stage of newspaper advertisement; when that stage was reached in any department of science it might be depended upon that the men of science themselves were beginning to discredit the original discovery. There were some who believed vitamins to be actual substances, while others—to whose views Dr. Elliot evidently inclined—considered them to be, not substances, but merely a balance between various factors. He went on to speak of the distinction between tissue-building foods and energy-yielding foods, and described the work of Lavoisier on oxidation in the body, just as it took place in a furnace, and of Liebig, to whom the classification of foods into proteins, fats, and carbohydrates was due. Man, said the lecturer, was a parasite upon the green plant, just as truly as the green fly was a parasite upon the rose. He described nitrogen and its powers, in some forms so innocent, in others so tremendously destructive, and in food, where its molecules could be taken apart and built up again into a new combination within the body, responsible largely for vitality. He showed how the body used iron as the machinery for taking oxygen from the air and conveying it to every tissue, also how necessary calcium was even in the repair of the smallest wound, how chlorine was handled by the soft tissues, and so on. He believed that the mineral elements in diet had received less attention than their important place deserved. One of the few things established as the result of a study of dietetics was that monotony in diet was dangerous, and the danger could not altogether be disregarded even in a civilization in which the *chef* had more resources than ever before; for our people lived very largely on imported foods—this country spent about £500,000,000 a year on imported foodstuffs—and it might well be that these products were deficient in some vital principles. Fresh green foodstuffs would supplement many deficiencies. The instincts of man might be depended upon to some extent as to diet, and the instincts of animals in the way of supplementing any deficiencies were often uncannily correct. A pig kept for twenty days on a diet deficient in lime, when let out of its sty went straight to a heap of builder's lime and took its fill. In conclusion the lecturer uttered a warning against paying heed to anyone, medical man or other, who claimed to understand the process of nutrition. These things were still mysteries, and the man of science was holding up a candle in the night by which to descern only the extent of the things he did not know. The chair was taken by Dr. C. F. Routh, who, in thanking the lecturer, referred to the extent to which food, like dress, passed through phases of fashion.

THE SECRETARIES' CONFERENCE.

THE Conference of Honorary Secretaries (reported in the SUPPLEMENT this week) owed much of its success to the character of the programme provided. Four secretaries, each of whom is doing yeoman service for the Association, had been asked to prepare short papers covering some aspect of local activities, and instead of an address to secretaries we had a discussion amongst secretaries which should prove of considerable value. Although the difficult nature of the area necessarily limits the work done in Caithness and

Sutherland, Dr. Asher's paper was really the most striking contribution to the discussion, for it showed that, in country which even headquarters would be inclined to accept as a sufficient obstacle to corporate activity, the Division is able to exist as a distinct entity, and to bring the local profession into direct contact with the life of the community. Dr. Livingston's paper dealt with an area which might have been thought difficult had not the Caithness and Sutherland comparison been supplied in advance. His suggestion that, whilst a close study of individual members and non-members with constant personal contact is the first essential of successful organization, it is a good policy for the secretary himself to direct rather than carry out the policy adopted in connexion with propaganda, was on a high plane of statesmanship—but it requires a statesman to give it full effect. It was unfortunate that Dr. Farquhar Murray should have been prevented from attending. In his paper he laid particular stress on the necessity and possibility of offering to the newly qualified such a welcome as will ensure their membership at the outset of their professional career, and indicated his methods of providing them with material help as well as general good fellowship. Mr. Webber gave a clear and stimulating sketch of the manner in which Nottingham is meeting the definite, though admittedly limited, demand for facilities for local post-graduate work in the Divisions and Branches. The discussion that followed showed the wisdom exercised in the selection of the openers and the preparation of the papers, for the difficulties dealt with, and the questions raised, were those common to the majority of areas, while the practical suggestions made were clearly applicable to many cases. There was general agreement on the importance of social activities, as providing the basis of personal fellowship essential to sound medico-political work; on the importance of the most critical scrutiny and analysis of members' and non-members' lists, and the importance of attracting the newly qualified. The moral of the whole discussion, implicit if not clearly stated in all that was said, was that it is an absolute essential of success in local organization for those responsible for the direction of Association activities to have a definite scheme, based on the particular needs of their areas, and to work to that scheme deliberately and persistently. It was unfortunate that an excellent suggestion for raising the status of the Conference and securing its continuity, by electing the chairman for the next meeting, was not formally proposed, and lapsed, presumably through an oversight. The discussion after tea was ragged. "Consideration of the member and non-member percentages" was too indefinite an item to secure any constructive suggestions, more especially as those present had not had an opportunity of considering the document beforehand. It was, however, the occasion of an extremely useful and interesting statement by Dr. Drever of the manner in which he has analysed and classified the member and non-member lists for Scotland.

Medical Missionary Breakfast.

THE Medical Prayer Union held on July 25th what is hoped to be the first of a series of medical missionary breakfasts in connexion with the Annual Meeting of the British Medical Association. A large number of guests were present at the Queen's Hotel, Southsea, where they were welcomed by the President, Mrs. Scharlieb, who was supported by the Bishop of Winchester, Bishop Ingham, the President of the Association (Mr. C. P. Childe), and the Medical Secretary (Dr. Cox). Greetings from the Association of Medical Missionaries in China were conveyed by Dr. Duncan Whyte, who emphasized the satisfaction of medical work abroad, and ascribed it to the absence of any fear of competition, the ability to treat poor patients freely, and the opportunity of taking up any specialty with certainty of abundant material for investigation. The meeting was addressed by Dr. G. E. Dodson of South-Eastern Central Persia, and Dr. C. C. Chesterman of the Congo. Dr. Dodson drew a vivid picture of the Persian plateau, with its extremes of climate, and its intelligent Aryan population, debarred by the influence of the Koran from progress along Western lines. He contrasted the conditions of public health twenty years ago with those brought about by the patient labours of medical missionaries, and spoke particularly of the ravages of rickets, due to the custom of putting little children, at the age of 5 or 6, to work at the carpet looms. They sit on planks in sunless, airless hovels from sunrise to sunset, with half a day's holiday in the week, and their pay allows only of a diet of dry bread and dried skimmed milk. Many hundreds of cripples had been relieved by transverse osteotomies, but for the girl wives the pelvic deformity means certain death at the first pregnancy. Dr. Clement Chesterman approached his subject from the psychological aspect, and suggested that the mentality of the African native might be compared with that of the paranoiac in its suspicions and terrors of persecution. The difference between the native and the civilized mind and physique he ascribed rather to an endocrine problem than to a different stage of evolution, and believed the psychological condition to result from an inhibition of love. He described the medical work in Africa as a process of combating great scourges that sweep the country rather than treating "cases" of disease, and spoke of the successful results now being obtained with tryparsamide injections for sleeping sickness. A brief speech by the Rev. Dr. J. G. James, and benediction pronounced by the Bishop of Winchester, closed a very successful meeting.

The Temperance Breakfast.

A PUBLIC breakfast was held at the Town Hall on Thursday morning, by invitation of the National Temperance League. The President of the British Medical Association (Mr. C. P. Childe) took the chair, and the hostess was Dame Sophia Wintz, successor to the late Dame Agnes Weston in the work of the Royal Sailors' Rests. The principal address was given by Mr. C. J. Bond of Leicester, who repeated some of the statements made in his presidential address to the Society for the Study of Inebriety (BRITISH MEDICAL JOURNAL, July 22nd, 1922, p. 142) on the expenditure on alcohol of certain large voluntary hospitals over a period of more than a century. He showed that the expenditure rose and fell very much in accordance with national expenditure under the same head, and that the hospitals, in respect to alcohol consumption, had not led public opinion but had followed it. The records also showed the result of the influence of individual teachers at the medical schools who happened to have strong views, one way or the other, on the subject of alcohol. He had something further to say about the salvage work which these institutions performed. To an unrealized extent the voluntary hospitals of this country, at great cost to themselves, were rescuing people from the results of their own anti-social indulgence. The present was a very important time in temperance progress, and it was very necessary that the members of the medical profession should inform themselves of the latest results of scientific inquiry with regard to alcohol. Sir Robert Armstrong-Jones proposed a vote of thanks to Dame Wintz and the President; this was seconded in an amusing speech by Sir StClair Thomson, who spoke of the pleasure with which he found himself side by side with his fellow student, the President. Even in those days Mr. Childe had a calm and judicious mind, that right judgement in all things for which we prayed every Sunday, and he was also a good sportsman.

Medical Notes in Parliament.

[FROM OUR PARLIAMENTARY CORRESPONDENT.]

BILLS.

Dentists Bill.—A Dentists Bill introduced by the Marquess of Sligo was read the second time in the House of Lords on July 24th. It had already passed all its stages in the Commons. Under the Act of 1921 the right of admission to the *Dentists Register* was extended to unqualified men who had served in the war and had before July 18th, 1921, attained the age of 23—provided that they passed a specified examination, though not the whole course. The bill proposes that the concession shall apply to ex-service men who had, before the date of November 11th, 1921, attained the age of 21—in other words, it extends the age of concession by two years and a few months. The Earl of Onslow said that the Government looked with favour upon the bill.

Intoxicating Liquor Bill.—The bill to restrict the sale of intoxicating liquor as regards persons under 18 years of age was passed through Committee in the House of Lords without amendment on July 24th and read the third time on July 25th.

Smoke Abatement Bill.—On the motion of Lord Onslow, on July 25th, a Smoke Abatement Bill, to stiffen the law and enlarge penalties, was given second reading. Viscount Novar, Secretary for Scotland, said he hoped to introduce a second bill for that country this autumn. Lord Onslow announced, in reply to inquiry, that he would endeavour to press his measure during the autumn session.

National Health Insurance (Consolidation) Bill.—This measure, introduced in the Upper House by the Earl of Onslow on behalf of the Government, was read the second time on July 26th. The Minister stated that as soon as it was passed the Government would undertake the duty of consolidating the many statutory regulations which governed National Health Insurance.

Small-pox and Vaccination.

Mr. Adams asked, on July 25th, whether in view of the fact that public vaccination was controlled by the Poor Law authorities who had no responsibility for the prevention of small-pox, the Minister of Health would take steps to transfer their powers in this connexion to the health authorities. The Minister of Health (Mr. Neville Chamberlain) said that this suggestion was under consideration in connexion with the general question of possible amendment of the Vaccination Act.

Mr. Rhys Davies asked under what Act a medical officer of health had power to isolate compulsorily healthy people; and whether he would inquire into the fact that the medical officer of health of Taunton threatened a perfectly healthy family from Gloucester with a period of isolation if they persisted in their refusal to be vaccinated, and in consequence the family returned to Gloucester where they were examined by the small-pox officials and given a clean bill of health. Mr. Chamberlain said he was not aware of any Act of Parliament conferring upon a medical officer of health power to order compulsory vaccination. He promised to communicate with the local authority in regard to the particular allegation.

Insulin Treatment for Diabetes.—Viscount Ednam asked, on July 25th, whether diabetic sufferers were able to obtain insulin treatment at a lower cost than 10s. a day, although panel patients under the Insurance Act were obtaining free treatment. Mr. Chamberlain replied that the average cost of insulin was at present about one-third of the figure mentioned, though the treatment of exceptionally severe cases, such as must go to an institution, might cost more. It was within the power of the guardians, on the advice of their medical officer, to pay for the supply of insulin in cases of destitution. He did not agree with Viscount Ednam that the Ministry should control prices. The cost had been reduced already very materially, and there was good reason for hope that it would be further reduced.

Private Patients in Mental Institutions.—Lord E. Percy, on July 26th, dealing with a lengthy question by Mr. T. Griffiths, said that in the year 1922 there were three private institutions in the provinces which had failed to comply fully with the requirement of Section 8 of the Lunacy Act. This failure did not invalidate the reception orders. The authorities concerned had been warned and had given assurances that the law would be strictly observed.

Answers in Brief.

The Minister of Health informed Mr. Adams, on July 25th, that the reorganization of the registration service was being considered, and a suggestion that the administration should be transferred from the Poor Law to the health authorities would be borne in mind.

Only four authorities in Scotland have taken exception to the draft minute issued recently by the Scottish Education Department providing for the payment from the Education (Scotland) Fund of grants in aid of training of health visitors. As the Scottish Education Department is in receipt of the equivalent spent in England for the same purpose, it is held that the Scottish authorities cannot properly refuse to accept the corresponding obligation.

The Minister of Health has stated that the form which would be issued to vaccination officers by his department would be that set out in the schedule to the Vaccination Act, 1907. The Order recently issued stated that declarations must be made in a form which might be obtained from the vaccination officer, or in a form to like effect. It did not mean that a person who wished to make a conscientious objection must apply to the vaccination officer for the form.

INTERNATIONAL PHYSIOLOGICAL CONGRESS.

MEETING IN EDINBURGH.

WE reported last week the inaugural meeting of the eleventh International Physiological Congress which began in Edinburgh on July 24th, and presented a reproduction of the medal of the Congress showing on the obverse the head of William Harvey to the left, and on the reverse the name and date of the Congress.

Insulin.

Immediately after the conclusion of the President's address Professor J. J. R. MACLEOD of Toronto gave a lecture to the Congress, the full text of which is published at page 165.

In the afternoon Professor Macleod gave a demonstration of lantern slides bearing on insulin. Among the points illustrated was that the hypoglycaemia, respiratory increase, and restlessness, followed by convulsions, which were caused by excessive doses of insulin, all showed a close parallelism; it was, however, necessary to distinguish carefully between some of these symptoms, which were directly due to insulin, and others, like the convulsions, which were a secondary toxic condition. He drew attention to the fact that in addition to exogenous hyperglycaemia there were numerous forms of endogenous hyperglycaemia, due to sudden mobilization of the glycogen of the liver—for example, that produced by epinephrin. This could be controlled by insulin, as could also the hyperglycaemia following puncture of the hind-brain. The lantern slides showed very strikingly the uniformity with which this occurred. An interesting series of observations had been made by Dr. Allen upon the effect produced by insulin administration upon the metabolism of proteins; it had been shown that nitrogenous substances were saved, just as were carbohydrates, under the influence of insulin.

Dr. F. G. BANTING (Toronto) read a paper upon insulin, using that term to signify a substance, isolated by chemical means similar to that used in making preparations of the pancreas, which would not only lower blood sugar in rabbits, but also in depancreatized dogs, and which would relieve their symptoms. It had been shown, he said, that insulin occurred in the blood of normal man, dog, and rabbit, but it could not be demonstrated in the blood of depancreatized dogs. Whether it was contained in the cells or plasma had not been determined. Approximately one unit of insulin could be obtained from 30 c.cm. of normal rabbit blood. The blood of a rabbit showing hypoglycaemic convulsions contained more insulin than that injected to render it hypoglycaemic. The tissues (except the pancreas) of such hypoglycaemic rabbits did not contain demonstrable amounts of insulin. The urine of normal man contained small amounts of insulin. The whole blood of hypoglycaemic rabbits in convulsions injected intraperitoneally into normal rabbits or mice produced no symptoms of lowering of blood sugar. Dr. Banting suggested that this was due to some antibody, or to the insulin being involved in some complex, from which it was only liberated by the process of extraction.

He then proceeded to speak of the factors influencing the production of insulin. While in certain early cases of diabetes mellitus no morphological changes in the pancreas could be demonstrated histologically, more advanced cases did show changes, and in certain types of diabetes these were of a purely degenerative character. This might suggest that in these cases the islets had suffered from prolonged overwork, that the metabolism of sugar threw a strain on them, and that sugar might stimulate insulin production. An attempt to demonstrate this action had been made as follows. Dogs were anaesthetized with ether for thirty minutes and immediately afterwards received an intravenous injection of 2 grams of glucose per kilo of body weight. This caused a sharp rise in blood sugar, with an abrupt fall to a subnormal level, then returning to normal; the whole period of fall being approximately eighty minutes. Subsequently the same dogs, during the period of anaesthesia, were depancreatized and immediately given the same amount of glucose intravenously. The same abrupt rise

in blood sugar occurred. There was a slight fall during the first twenty minutes, and then either no decline or a very gradual decline for hours. The glucose injected did not automatically leave the blood stream, but fell only when an active pancreas was present, presumably due to the excretion of insulin. This was also suggested by the drop in the normal curve to a subnormal level. Insulin in an active form disappeared rapidly from the blood after pancreatectomy. In blood taken from dogs after large doses of glucose insulin had not been demonstrated. The response to glucose injection was essentially the same, though slightly delayed in a dog with a large denervated pancreatic graft.

Dr. J. R. MURLIN (Rochester, New York) read a joint paper by himself, Mattill, Piper, and Kimball on the chemical and physical properties of insulin. It was stated that a rapid method of preparing insulin had been worked out based upon the following properties: thermo-stability to boiling point as shown by Murlin and Kramer, 1913-16, solubility in water, precipitation by complete saturation with sodium chloride, solubility in 70 per cent. ethyl alcohol, and precipitation by means of amyl or butyl alcohol.

Fresh pancreas, of beef preferably, was macerated in 4 volumes of 0.2 NHCl and brought rapidly to the boiling point. After cooling it was neutralized to a *p*H of 4 and filtered overnight. The first filtrate, when given by the stomach to dogs made diabetic by the removal of the pancreas, controlled the diabetic symptoms. It therefore resisted peptic digestion. Precipitation of extraneous proteins with sodium chloride seemed to offer some advantages over ammonium sulphate, as suggested by Shaffer. The entire precipitate was soluble in 70 per cent. ethyl alcohol, from which the potency might be precipitated by 3 to 5 volumes of amyl or butyl alcohol. The final precipitate was readily separated by centrifuging, and, after the amyl alcohol had been removed by vacuum distillation, it was then dissolved in sterile water to make an extract of any desired concentration. In final form it gave a very faint biuret reaction which appeared to be due to traces of protein as impurity. Each step must be carried out at a definite hydrogen ion concentration. For thermo-stability the reaction might be at a *p*H of 6.7 to 7.2, or below a *p*H of 4. Between these limits the potency seemed to be regularly destroyed by heating to 80° C. for half an hour. For stability in final form the reaction might be from a *p*H of 4 to a *p*H of 2. Preparations had been kept for four months without loss of potency.

Potency did not seem to depend upon nitrogen content, and its thermo-stability and survival in acid reaction up to 0.5 NHCl indicated that insulin could not be an enzyme, but was properly called a hormone.

In a paper on the part played by insulin in carbohydrate metabolism Dr. GUNNAR AHLGREN (Lund) said that respiration in tissues from normal and from depancreatized animals had been studied both with and without the addition of insulin. The power of the tissue to reduce methylene blue (Thunberg's method) had been used as a measure of the tissue respiration. When glucose and insulin were present in suitable concentrations the glucose was split into products able to serve as substrate for the oxidizing enzymes, as was indicated by the accelerated decolorization of methylene blue. Fructose and galactose were split by the tissues without the aid of insulin. Insulin did not accelerate the oxidation of β-oxybutyric acid, lactic acid, and glycerophosphoric acid.

Functional Activity of the Suprarenals.

Dr. W. CRAMER (London) described some experiments demonstrating the functional activity of the suprarenals. By the histo-chemical method the granules of adrenaline could be rendered visible both within the cells of the medulla and in the process of secretion into the blood. In this way direct and conclusive evidence could be obtained concerning the conditions under which secretion of adrenaline occurred. The method had the further advantage that the animal could be kept under perfectly normal conditions, so that the factors determining secretion were studied without the interference of anaesthetics or surgical procedures which of themselves excited the secretion of adrenaline. In this way experiments on mice had demonstrated a very distinct secretion of adrenaline under a number of conditions. The observations showed: (1) That in response to specific stimuli the adrenal medulla was capable of an autonomous vigorous secretion as definite as the secretion of the pancreas or salivary glands. (2) That one of the most important functions of the gland which it exercised through the secretion of adrenaline was a metabolic one connected with the heat regulation of the body. Both the physical and the chemical heat regulation of the body were under the influence of the sympathetic system. Thus general sympathetic stimulation produced mobilization of the liver glycogen; the body cells responded by increased oxidation to this inflow of carbohydrate into the blood stream under the influence of sympathetic stimulation. Increased heat production resulted. The physical heat regulation depended on the calibre of the cutaneous vessels, and in some species of animals on the activity of the sweat glands, in others on the erection of the hairs of the fur. These three factors were also under the influence of the sympathetic. Thus hyperactivity of the adrenal medulla with massive secretion of adrenaline produced a fever due to increased heat production and diminished heat loss—"sympathetic fever." Conversely, adrenal insufficiency due to exhaustion of the gland or to other causes led to a subnormal body temperature. The thyroid gland had a synergetic action. The action of the thyroid hormone was slower and more prolonged than that of adrenaline. Its direct action on metabolism and on the heat regulation of the body was effected mainly by continued mobilization of the liver glycogen. Climatic conditions produced their effect on metabolism and on the nervous system generally in virtue of the fact that increasing the loss of heat from the body acted as a powerful stimulus to the functional activity of the adrenal and thyroid glands.

Internal Secretion of the Testicle.

Drs. E. RETTERER and S. VORONOFF (Paris) read a paper on the relation of physiological phenomena with the structure of the grafted testicles. Histological examinations practised every month for nearly two years by Professor Retterer upon testicles grafted by Dr. Serge Voronoff clearly proved that from the moment when the testicular cell is transformed at a certain age to a specific element, notwithstanding morphological changes produced by the graft, that cell continued to possess the property of elaborating products of internal secretion which determined the physiological phenomena.

The Thyroid and the Autonomic Nerves.

Dr. HENRY DRYERRE (Edinburgh) said that in an attempt to relate the different views as to the action of thyroid preparations upon the autonomic nerves, he had investigated such effects resulting from the injection of thyroid extracts and of thyroxin upon these nerves, as might be manifest in experiments lasting several hours. To allow for individual idiosyncrasies a large number of animals were used and inquiry was made also into modifications caused by the anaesthetics used. The experiments had been conducted at such intervals that any seasonal variations in the responses might be noted. The results were not consistent and similar results could be obtained by the injection of extracts of spleen, of liver, and even of simple Ringer's solution. It was also demonstrable that such variations in the responses could occur without any injections having been made. The conclusion was formed that injections of extracts of thyroid gland or of thyroxin had no specific action upon the sensitiveness of the cardiac fibres of the vagus, or on the depressor nerve, which could be demonstrated in the course of an "acute" experiment.

Antidromic Action.

Professor J. N. LANGLEY (Cambridge), in a paper on antidromic action, said that the brilliant flush normally produced in the pad and toe cushion in decerebrated cats by stimulating the peripheral ends of the posterior roots of the seventh lumbar nerve ceased on section of the superficial plantar nerves a little proximally of the pad, and there were only slight and variable effects. From a consideration of this result and of the results of varied observations on stimulation after nerve section he concluded that antidromic impulses did not cause appreciable dilatation of arterial trunks in any part of their course down to the digital arteries.

If the abdominal aorta were clamped, stimulation of the

posterior roots still caused some flushing on the homolateral side. This seemed to prove that the capillaries were affected independently of arterial blood pressure, either directly by nerve impulses or by metabolites. Whether the digital arteries or their branches dilated was more difficult to determine. In the cat each toe was supplied by a single artery, one side by the central part and the other side by the peripheral part. When the sensory fibres to the peripheral part were stimulated, usually one-half of the toe only flushed, the other half becoming pale. When the sensory fibres to the central part were stimulated, the flush usually spread farther over the mid-line, but a small oval pale area was left on the opposite side. The greater outspread of flushing in the latter case suggested arterial dilatation, but if this occurred the whole of the opposite side should flush. Flushing in one part of the foot was usually accompanied by pallor in the rest of the foot. It occurred after section of the nerves to the foot, and did not appear to be due to an axon reflex. This showed that capillary diameter was greatly dependent on local blood pressure.

Humoral Transmission of Nervous Impulses.

Professor H. J. HAMBURGER (Groningen) said that hitherto physiologists had recognized two methods of co-operation between organs—one established through interference of the central nervous system in cases where a quick response is needed (reflexes), the other coming into play where slow processes are concerned, exemplified by the influence of the thyroid secretion on metabolism and growth, and where a correlation is possible without any nervous connexion (graft under the skin of the abdomen). A new third form of correlation between organs, used in processes neither slow nor quick, was activation of substances set free by means of nervous stimulation. Experiments made by Dr. R. Brinkman, Miss E. van Dam, and Dr. L. Jendrassik had demonstrated that on nervous stimulation of the heart substances were set free that influenced the contractions of the stomach and the gut in the same way as if the nerves of those organs were stimulated by an electric current. The substances liberated by stimulation of the vagus quickened the movements of stomach and gut. Those liberated on stimulation of the sympathetic of the heart stopped the movements of the stomach. That such substances really existed could be proved directly by physico-chemical methods. This humoral transmission suggested a number of problems. Thus the physiologist would consider the latent period and the after-effect of vagus stimulation on the heart beat in connexion with the liberation of certain substances. The clinician would think of the bearing of these facts on the nature of vagotonia and sympathicotonia, and would endeavour to neutralize the unfavourable influence of these substances. On the supposition that there might be a reserve of vagus substances in the atrium of the newly killed rabbit, an extract in Ringer's fluid was made. It appeared that this extract had the same influence on the contraction of the gut as stimulation of the vagus. This influence was neutralized by atropine. It seemed certain that a correlation similar to that described would be found between other organs also. There was much evidence to lead to the belief that the three forms might finally be reduced to one.

Alternating Periods of Activity and Rest as a Property of Living Tissues.

Professor P. T. HERRING (St. Andrews) said that the alternation of periods of full activity and complete rest appeared to be common in living tissues. It had been observed in the capillary blood vessels of muscle and skin by Krogh, and in the glomerular and other blood vessels of the kidney by Richards. It had been noted in voluntary muscle by Barbour and Stiles. Fluctuation was observable in some of the receptors of the skin and had been recorded by Waterston in regard to the sensations of heat and cold. There was reason to believe that fluctuation was of normal occurrence in nerve, muscle, and glands. The assumption of a "law of fluctuation" appeared to be necessary in the case of all tissues which obeyed the law of "all or nothing." That law applied to the tissue units, and the organs comprised of such units could only manifest gradation of activity by the employment of varying numbers of groups of units. The law assumed that in the moderate activity of an organ the groups of units which were in action were constantly varying so that all units were employed in rotation, individual groups coming into action and going out of action in orderly sequence. This arrangement prevented undue fatigue of the units, permitted varying degrees of graded activity of the organ as a whole, and preserved an important reserve which could be brought into action when the necessity arose if there had been long periods of disuse. Fluctuation might be ascribed to fatigue in receptors and synapses, or might be an inherent property of certain cells. Its occurrence provided an explanation of many physiological and clinical phenomena.

The Sensory Activity of the Skin.

Professor DAVID WATERSTON (St. Andrews) recalled that it had been shown by Goldscheider, by Head and Rivers, and by others that the cold and hot spots of the skin were variable and inconstant and readily exhausted by stimulation. By repeated examination of a marked area of skin it had been found that the total number of receptive spots was very much larger than those detected at a single examination. When the local condition of the skin was modified by the application of a mustard leaf practically all points of its surface were found to be sensitive to warmth. It followed that the whole skin surface was potentially capable of receiving thermal stimulation, but that at any one time only a few points were active. There was a coming and going of activity, analogous to the fluctuation found in the skin capillaries. Experiments showed also that the receptor mechanism for the sensation of touch was formed by the epithelial cells, and not by the "tactile" organs found in the deeper layers of the skin and the subcutaneous tissues.

Water Intoxication.

Dr. LEONARD G. ROWNTREE (Rochester, Minnesota) said that in man and animals (dog, cat, rabbit, and guinea-pig) water ingested in excess of the excretory ability of the organism resulted in water intoxication. Water intoxication was manifested by restlessness, asthenia, polyuria, frequency of urination, diarrhoea, salivation, nausea, retching, vomiting, muscle tremor and twitching, ataxia, tonic and clonic convulsions, frothing at the mouth, helplessness, and stupor and coma. The convulsions were general, extremely violent, and in the main resembled those of strychnine poisoning. They might recur at intervals of a few minutes. The condition terminated in death unless the excessive intake of water was discontinued. As a rule, manifestations of water intoxication disappeared promptly after the intravenous injection of hypertonic salt solution in appropriate quantities. The effect of the excessive administration of water on the blood had been studied in detail. Water had been given at half-hourly intervals in amounts of 50 c.cm. for each kilogram of body weight. The haemoglobin concentration was found to fall progressively. This change might be as great as 25 per cent., and was most rapid between the second and third hours after starting the experiment. It continued to increase slightly as long as the water was given. The haemoglobin returned to normal in from twelve to twenty-four hours after ingestion was discontinued. There was a decrease in the refractive index indicating a diminution of the protein per unit of blood serum. The viscosity was decreased. The change in protein content was similar to that in the haemoglobin content of the blood. The salts in the blood serum were likewise decreased. The changes in protein, haemoglobin, and salts (chlorides) were similar, and approximately of the same magnitude. Part of the change might be due to a washing out of salt by diuresis and vomiting.

Demonstrations.

On Friday morning several cinematograph demonstrations were given by G. P. ZELIONY (Petrograd) on observations on dogs with cerebral hemispheres removed; by S. SIMPSON (Ithaca, N.Y.) on the gait in thyroidectomized sheep; by A. KROGH (Copenhagen) on capillary circulation; by O. FRANK (Munich) on the cardiogram; and by E. RETTERER and S. VORONOFF (Paris) on the relation of physiological phenomena with the structure of grafted testicles.

(*To be continued.*)

England and Wales.

THE MANCHESTER AND DISTRICT RADIUM INSTITUTE.

THE annual report of the Manchester and District Radium Institute for the year 1922 relates the result of the first complete year's work of the Institute in its new building. The number of cases registered for treatment was 799, a slight increase over the number for the previous year; 514 emanation plates and 1,281 emanation tubes were made during the year, which represented practically the full capacity of the emanation plant. The total number of malignant cases treated was 584, and of these 59 were rendered free from sign and symptoms of disease during the year. Thus the percentage of perfect immediate results following radium treatment was slightly over 10. The best results were still obtained with carcinoma of the cervix uteri; 29 cases were apparently cured. With improvement in the technique in the treatment of carcinoma of the mouth and tongue with unscreened emanation tubes the number of successful cases showed a gratifying increase to 10. The number of cases of rodent ulcer that came up for treatment was 85, and 41 were apparently cured.

The total number of out-patient attendances during the year was 4,900; the in-patient attendances numbered 912. The increased number of in-patients was made possible by the accommodation now provided at the new Radium Hospital. During the year considerable improvements have been made in respect of the protection of the workers at the Institute. A lead box with walls one inch thick for the holding of emanation tubes has been constructed and so arranged that the door opens downwards, and thus gives considerable protection. A second device has been adopted with the object of protecting the nurses' fingers when making up plates for application of radium from the surface, whilst the emanation plant has been completely covered by adequate lead protection. Investigations are in progress for the treatment of cases of inoperable carcinoma by means of a combination of radium and diathermy, and a new diathermy apparatus has been installed at the Institute for this purpose. At the same time the application of deep *x*-ray therapy combined with radium is being carried out with the aid of the two new intensive *x*-ray outfits at the Royal Infirmary. It is too early yet to speak of the late results of this form of treatment, but the initial response is said to be satisfactory. Reference has already been made in a previous issue of the JOURNAL (June 2nd, 1923, p. 949) to the special research which has been conducted into the effects of radium on blood serum in health and disease, further work on which subject has still to be done. The report shows that the work of the Radium Institute is being actively carried on, and that the results of the treatment in a number of cases is encouraging.

NURSES' HOME AT THE LIVERPOOL ROYAL INFIRMARY.

On July 24th the Duke of York laid the corner stone of the new Nurses' Home of the Royal Infirmary, Liverpool. Addresses of welcome to the Duke (who was accompanied by the Duchess) were read by the Lord Mayor of the City, and the President, Mr. Thomas H. Bickerton, consulting ophthalmic surgeon of the Royal Infirmary, who reviewed the history of nursing in relation to the sick. The name of William Rathbone will be for ever associated with the institution of a trained nursing staff for the sick poor of Liverpool. The present building, erected 63 years ago, has been enlarged from time to time as the demands of the Royal Infirmary increased, by the addition of houses in the immediate vicinity. The new building would have been begun long ago but for the war. The original estimate was between £40,000 and £50,000, but costs have increased so much that the money suffices only for the erection of one-third of what is necessary. Between £4,000 and £5,000 is required to complete and furnish this portion; with this object the Duchess of York had consented to receive purses, each containing £25. In this manner £2,085 15s. 6d. was presented. In his reply the Duke of York expressed his pleasure at being present to promote so good a cause and made mention of his own personal indebtedness to the trained nurse's services. He presented a bronze medallion awarded by the Carnegie Hero Trust Fund to Mr. Charles B. Wood, who had been *x*-ray operator in the Royal Infirmary since 1903 and had become a victim of *x*-ray dermatitis necessitating several operations and now totally incapacitating him from performing his duties. A new gynaecological operating theatre was formally opened by the Duke, and finally the corner stone was laid. The consulting honorary staff and the senior members of the acting staff were presented to the Duke of York. An unfortunate event, due to the plunging of two startled carriage horses into the crowd just as the Duke was about to enter the Royal Infirmary, resulted in the injury (fortunately not serious) of some fourteen persons. They were immediately taken into the Infirmary and received the attention of Mr. Frank Jeans, one of the honorary surgeons. The Duke visited the sufferers before leaving the hospital.

Scotland.

SCOTTISH NATIONAL LIBRARY.

THE generosity of the Faculty of Advocates in Edinburgh and the munificence of a private donor, Mr. Alexander Grant, have combined to provide Scotland with a valuable National Library. Some months ago the extensive library in charge of the Faculty of Advocates was offered to the Government, so that it might be managed on national lines in Scotland, similar to those of the British Museum in London. An obstacle in the way of the acceptance of this offer was the absence of any fund to provide accommodation for the books. Within the past three weeks this difficulty has been removed by an Edinburgh citizen, Mr. Alexander Grant, who has provided £100,000 necessary for the permanent endowment of the library. This library has had an interesting history. It was founded in 1680, and the first catalogue, printed in 1692, contained no fewer than 3,140 entries. It was then valued at £14,400 Scots or £1,200 sterling, and included not only legal volumes but books in all departments of learning. In 1709 the Copyright Act of Queen Anne conferred on the library the right to claim a copy of every book entered at Stationers' Hall. This privilege has been confirmed in all subsequent copyright Acts, and applies to every book published in the United Kingdom. The library also has received from time to time numerous presents of books and manuscripts. Many of the latter especially are of great interest and importance. The number of volumes in the library is now well over 700,000. Among the most recent acquisitions is the letter written by Mary Queen of Scots to her brother on the morning of her execution. It is a beautiful specimen of sixteenth-century handwriting as well as a document of the first historical importance; it describes how, after having passed nearly twenty years in the captivity of Queen Elizabeth, the writer is ordered to be executed as a criminal. There are also in the library some twenty-one ancient Gaelic medical MSS. Of these sixteen are entirely medical and five or six partly medical. For their preservation we are indebted in the first place to two Celtic families who practised medicine in the Highlands of Scotland for several centuries. These were the family of McBeath or Beaton and that of McConacher of Lorn. The substance of these MSS. is taken largely from the ancient Greek and Arabic writers, and this fact shows a high standard of learning among the native Highland population of the Middle Ages. One of the MSS. is a treatise on materia medica, of which several copies are to be found in the British Museum and other places. Acknowledgements are made in it to the researches of the doctors in Salerno and Montpellier, but it is largely of native Scottish origin. It is to be hoped that, now that these MSS. are more accessible, some scholar may be found with sufficient knowledge of medicine, botany, and Gaelic to undertake the publication, especially of the last mentioned work.

B.M.A. Reception for Edinburgh Graduates.

At the Edinburgh Graduation Ceremony on July 20th, when as reported last week over 200 graduands received the degree of M.B., an interesting innovation was introduced by the Edinburgh and Leith Division of the British Medical Association, which held a reception on Tuesday, July 17th, in the hall of the University Union. It was attended by about two-thirds of those about to graduate. The Chairman of the Division, accompanied by a number of members of the Association, received the guests. Copies of the *Handbook for Newly Qualified Medical Practitioners*, published by the Association, were handed to the guests on arrival. After tea the company was entertained with various musical items by Mr. Watt Jupp, violinist, and Mr. Paterson Lamb, pianist. An address of welcome into the medical profession was delivered by Professor Lorrain Smith, Dean of the Faculty of Medicine in Edinburgh University, who dealt with some of the difficulties that had to be faced by practitioners at the outset of a medical career, and emphasized the great advantages that accrued from the pursuit of other interests and hobbies, and from co-operation between members of the medical profession. Dr. James R. Drever, Scottish Medical Secretary of the British Medical Association, then gave an address dealing especially with the functions of the British Medical Association and the advantages to be gained both by the individual members and by the profession at large from making the membership as nearly as possible inclusive of everyone in active practice. A most enjoyable meeting terminated with a vote of thanks, proposed by the Chairman, Dr. John Stevens, to Professor Lorrain Smith for his address.

Medico-Sociological Society of Edinburgh.

An excursion was made on July 7th by the members of the Medico-Sociological Society of Edinburgh to two ancient buildings of great importance in Scottish medical history. The society first proceeded to Torphichen Priory, some twenty miles west of Edinburgh. One of the members of the society stated that a colony of the Knights of the Order of St. John of Jerusalem had settled there in 1124, and had prospered greatly, inheriting all the Scottish property of the Templars on the suppression of the latter order in 1312. Throughout four centuries the Knights, both here and at almshouses and hospitals in other places, tended the sick poor. They had also tended the injured wayfarer, their most celebrated patient having been Edward I of England, when kicked by his horse at Falkirk in 1298. At the Reformation the Scottish Preceptory had been disbanded, the Preceptor becoming a temporal Baron with the title of Lord Torphichen. The Norman remains in the Gothic building were inspected by the society, as also the stones of sanctuary, a privilege which the Priory had possessed. The party then proceeded to the House of Kipps in the immediate neighbourhood. Here Sir Robert Sibbald had been born and had spent a large part of his later life in medical practice. He had been responsible for obtaining the Charter of the Royal College of Physicians of Edinburgh in 1681 through the mediation of Sir Charles Scarburgh, who came to Scotland as physician to the Duke of York. In 1685 Sibbald, with Archibald Pitcairne and James Halket, had become the first professors of medicine in the University of Edinburgh. Sibbald and his friend Pitcairne had thus been the founders of a medical school in Edinburgh. The House of Kipps formed still a fine example of the fortified Scottish country home of the sixteenth century.

Extension of Medical Benefit.

At the annual meeting of the representatives of branches of the Scottish Rural Workers' Approved Society in the Lothians District on July 14th, a memorandum by the Board of Management explained that the Society was now providing for its members, through the agency of the Scottish National Benevolent Association, dental treatment, medical and surgical appliances, and spectacles and other optical appliances. The secretary stated that these benefits, particularly dental treatment, were now being requested by members on a considerable scale, and that nearly £3,000 had been expended since these benefits had begun four months previously. It was reported that during 1922 sickness, disablement, and maternity benefits had accounted for £64,853 and medical benefit for £42,000. Donations amounting to £2,500 had been granted by the society to hospitals and district nursing associations in respect of 1922, including a donation of £325 to the Royal Infirmary of Edinburgh.

Ireland.

Free State County Councils.

Many matters of medical interest were discussed at a recent meeting held in Dublin of the Irish County Councils General Council (Free State). The principal questions under consideration were health (including tuberculosis, maternity and child welfare), reconstruction, and unemployment, in which connexion the demobilization of the army was discussed.

A recommendation in the report of the Standing Committee on health matters was adopted, proposing that the qualifications of all candidates for surgical, medical, and veterinary appointments by Local Health and Poor Law Authorities be in accordance with regulations made by the Minister of Local Government, to include competitive examinations, practical as far as possible.

The Committee also recommended the repeal of the Medical Charities Acts, and in substitution, the extension of medical benefit to insured persons and their dependants, and the preparation of a register of those unable to contribute towards the cost of medical treatment, and the provision of such treatment for this class The establishment of a medical service, paid by the State, and appointed under arrangements made by the State Health Authority, was recommended. It was agreed that the forthcoming legislation should make the present permissive health legislation mandatory on local authorities.

The Committee also recommended that tuberculosis, both human and bovine, should be made compulsorily notifiable. It was agreed to recommend that compulsory powers be given to the Tuberculosis Medical Officer to isolate persons suffering from tuberculous diseases where he considered isolation essential in the interests of public health. Recommendations were adopted also calling for effective inspection of cattle in respect of bovine tuberculosis; the application of the tuberculin test to milch cattle; the inspection of cowsheds, dairies, bakeries, and slaughterhouses; and for preventive treatment in the case of persons especially liable to contract tuberculous disease. It was agreed that there ought to be an abattoir in every city, town, and urban district with a population of 10,000 and over.

Approval was given to the scheme for medical inspection and treatment of school children and enforcement of regulations against overcrowding.

Victoria.

[From Our Own Correspondent.]

The Melbourne Hospital.

The Melbourne Hospital, one of the clinical schools attached to the University of Melbourne, was re-erected on its present city site some twelve years ago. It was felt then as now that the retention of that site was a mistake. It is completely divorced from the University, has no possibility of extension on its restricted area of five acres, is everywhere surrounded by city property, and, in some respects, particularly its out-patient department, is out of date. There has, therefore, been again raised the question of re-erecting the hospital on what is known as the Horse Market site. This site covers over sixteen acres, is in the closest proximity to the Medical School, is on high-lying land with an abundance of fresh air, has large possibilities of extension, and could be made to serve a much larger area of population than at present. The advantages

of the proposed transference are numerous and obvious, but a strongly entrenched conservatism still stands in the way.

THE UNIVERSITY.

The many friends of the Dean of the Faculty of Medicine, Professor Sir Harry Allen, will regret to hear that he has been given extended leave of absence on account of ill health. He has, however, made such rapid progress that it is hoped he may be enabled to resume active duty at an earlier period than was originally anticipated. Dr. F. L. Apperly, a Victorian Rhodes Scholar, has been appointed acting professor of pathology, and the duties of Dean are being temporarily undertaken by Professor Berry.

Dr. J. H. Anderson, Senior Lecturer in Anatomy, has resigned his position and will proceed to England. He has performed his manifold duties with such singular ability and conspicuous success as to make it certain that his loss will be severely felt. Dr. L. E. Hurley has been appointed to the vacancy.

The Director of the Walter and Eliza Hall Clinical Research Laboratory, Dr. S. W. Patterson, having received an important research appointment in England, has resigned. He is to be succeeded by Dr. C. H. Kellaway. Until the arrival of the latter the duties are being temporarily discharged by Mr. H. R. Dew, F.R.C.S.

THE AUSTRALASIAN CONGRESS OF THE BRITISH MEDICAL ASSOCIATION.

The arrangements for the first Australasian Congress of the British Medical Association are in an advanced stage and give every indication of a successful meeting. Visitors from overseas will be particularly welcome. They should communicate with Dr. A. L. Kenny, 13, Collins Street, Melbourne. Trade exhibitors should communicate with Dr. B. L. Stanton, Children's Hospital, Pelham Street, Carlton, Melbourne.

Correspondence.

THE PRESIDENT'S ADDRESS.

SIR,—One of the best editorials I have read for years in the BRITISH MEDICAL JOURNAL is that of to-day. In it you state: "The President would rather have healthy dwellings to prevent tuberculosis than sanatoriums in which to treat it." And you ask, "What, then, is to be the remedy? More houses, and better houses, of course. But how are they to be provided?"

The answer, in my opinion, is easy, and it is this: The purchase of agricultural land, for building purposes, at double its agricultural value. It is not so much a question of houses—it is a question of sites! Thousands in this country could build houses, but houses cannot be built upon air. And agricultural land is the one thing, for building purposes, that cannot be obtained at market value.

If a Land Act were passed so that the individual could buy a sixth of an acre for £20 or less, the housing question would, in my opinion, solve itself. Strips of land, half a mile deep, on either side of the King's highway, should be purchasable at double the agricultural value—that is, for £60 to £120 an acre. And then the individual should be allowed to purchase one-sixth, and only six houses should be allowed to the acre. If this were done the ideal of a sixth of an acre, a cottage, and a goat (as a non-tuberculous milk supply) would become a reality. The capital cost would be only £350 to £450, or a rental of 6s. to 9s. a week, and this rental could be reduced by the sale of vegetables or milk. The other assets would be evening occupation, sunlight, fresh air, and fresh milk and vegetables—in other words, health.

If these sites were purchasable, water could be supplied by road mains, and the trams run out and electric lighting provided. The main road would take the place of costly streets; the sewage would go back to its natural place—the soil, and 20 to 30 per cent. of town dwellers would return to the land. This would leave more air space and better habitations in the cities, and workers living by the roadside could reach their work by tram, especially if assisted by starting work at a reasonable hour in the morning. Every thrifty citizen, in my opinion, should have the chance of such a site, and I believe the response would enlighten the pessimists.

The best cottage or house would probably be one of "Redruf" bricks, with hollow walls, castellated top, and flat roof. The flat roof has many advantages, and could become a home sanatorium for a tuberculous inmate in the summer months.—I am, etc.,

Newcastle-on-Tyne, July 28th. T. M. ALLISON.

SIR,—Mr. Charles P. Childe's Presidential Address on Environment and Health at the recent Annual Meeting of the British Medical Association at Portsmouth, as reported in the BRITISH MEDICAL JOURNAL of July 28th, 1923, is, if I may say so, a survey of the greatest interest and value, but I am greatly disappointed to see in the section on tuberculosis the President's statement of the conditions of cure of this disease. Mr. Childe states that fresh air and sunlight are the essential conditions, not only essential but almost the sole conditions, and says that the cures at Alton are fresh air and sunlight. I venture to suggest that the feature of treatment at Alton is Sir Henry Gauvain's efficient system of splinting of various types, and that fresh air and sunlight are only adjuvants, though very valuable ones, but possibly preceded in value by abundance of wholesome food.

In other words, surely the basis of successful treatment of tuberculosis is rest. If the children with active tuberculous foci at Alton and elsewhere took full advantage of fresh air and sunlight and yet maintained the unrestricted use of the affected parts, then I think there would be few, if any, good results from treatment.

The same in pulmonary tuberculosis—the sufferer must rest if symptoms of systemic disturbance are to be relieved. Repeatedly I have heard of patients with active pulmonary tuberculosis being advised to seek "fresh air," and who have sought it with much exercise often in hilly country, with steady decline in health, when it was rest in bed for which their organisms were calling. For a long time in this sanatorium I have preached to my patients and others the value of rest in treatment, and have curtailed considerably in winter the free open-air conditions which cause such discomfort, discontent, and even harm in this country, and the results of treatment have not been impaired.

Fresh air is, of course, of importance in the treatment of tuberculosis, but, like graduated labour for pulmonary cases, it can be overdone. I submit that the essential conditions for the satisfactory treatment of tuberculosis in order of merit are rest, good and plentiful food, fresh air and sunlight.—I am, etc.,

CECIL G. R. GOODWIN.

Barrasford Sanatorium, Northumberland, July 29th.

SIR,—The President in his address alludes to cancer, tuberculosis, venereal disease, and alcoholism as scourges responsible for many deaths. We can protect ourselves against the last three—is there no means of protecting ourselves against cancer?

Without going into the pros and cons of the many theories of the cause of the disease, it seems to me that there is more evidence in favour of the organismal hypothesis than of any other. It is very probable that the organism is a protozoon similar to the *Coccidium oviforme* in the liver of rabbits, and that it is a parasite which spends part of its life cycle in another host, from which we become infected. It is possible, too, that the parasite is present in the blood of most individuals, and that it requires some previous susceptibility of the tissues to attract it and cause the epithelial cells of the part to cross the border-line and become malignant. For have we not a somewhat analogous condition in trypanosomiasis? Trypanosomes have been discovered in the blood of individuals not suffering from manifestations of the disease, and are not trypanosomes attracted to tissues irritated by the injection of turpentine, producing a fixation abscess?

I suggest, therefore, that we should endeavour to anticipate the onset of malignant disease by giving, after the

meridian of life has passed, a yearly intravenous injection of a parasiticide, such as a preparation of arsenic and mercury. I have yet to hear of a syphilitic, who has undergone salvarsan mercurial treatment, developing cancer, from which I firmly believe he is immune. Once the cancer cell has appeared the surgeon's knife is, and always will be, the only remedy.

It will be difficult, almost impossible, to prove my contention. There will be no immediate and brilliant results. To my way of thinking we are more likely to get better results in the prevention of cancer by medicinal means than in its cure.—I am, etc.,

Upholland, Wigan, July 30th. J. THOMSON SHIRLAW.

ENVIRONMENT AND INTELLIGENCE.

SIR,—In your issue of April 14th, on page 644, under the heading "Environment and Intelligence," you quote from a report of the Medical Research Council as follows: "That progressive improvement in home conditions may be expected to react favourably, not only on the health, but also on the intelligence of school children." That the more intelligent children are better cared for is beyond question, but it by no means follows that by improving domestic conditions we shall improve the intelligence of those living under them; indeed, I am convinced that this would not be the case.

Nothing is so hereditary as intelligence, and those of defective intelligence will tend constantly to gravitate towards the lowest stratum of society—that of the casual and the unskilled labourers—in which drink and disease are unremittingly carrying on their task of the elimination of the intellectually unfit.

Last year my nurses classified the homes of hundreds of cases of mental and physical defect into three grades—the "A" grade homes being "good," "B" grade "fair," and the "C" grade "bad." Obviously such a classification must be arbitrary, but those put in Grade "C" were all such as were beyond question of a kind to make an altogether undesirable environment for young human beings. In Grade "A" were put 23 per cent., in Grade "B" 69 per cent., and in Grade "C" 8 per cent. Of the cases of mental defect investigated 58.33 per cent. came from the 8 per cent. which constituted the "bad" homes. These homes are made and kept by the parents who manifest the characteristics of mental defect—namely,

(*a*) The inability to plan their lives to ensure a reasonable standard of comfort.
(*b*) The inability to resist suggestion—to say "No, thank you," to excess of alcohol, or to deny themselves sexual pleasures—resulting in alcoholism and venereal disease.
(*c*) The inability to grasp an abstract idea: and "where there is no vision the people perish."
(*d*) The inability to persist in any undertaking. This want of persistence is a marked characteristic of primitive races and of mental defectives.

In the State schools of New Zealand children of all classes are educated, and such schools reflect very fairly the average health of the population. The private schools are, on the other hand, on the whole a selected class of children from families which for various reasons prefer to pay for their children's education. Presumably the tendency to dental defect would be approximately the same as in the children attending the State schools, yet the number of perfect sets of teeth varies considerably.

Of 197 children examined at P. School 11 (that is, 5.5 per cent.) had teeth free from caries or extractions.
Of 136 children examined at H. N. School 5 (3.69 per cent.) had such teeth.
Of 28 children examined at a private school in the same district and drawn from the same population but selected by the fact that a small weekly sum is paid for the course of instruction, 6 (21.4 per cent.) had such teeth.

The condition of the teeth is a better criterion of home conditions than clothing, as it can only be affected by persistent and intelligent parental care. Instead, therefore, of assuming that either good clothing or good teeth cause high intelligence we must conclude, I think, that the parents of intelligent children, being themselves intelligent, will exercise such care and foresight in the upbringing of their offspring that a good home, suitable clothing, and sound dental and physical health will result. I am quite prepared to admit that dissolute and alcoholic parents of good intelligence may beget children of low intelligence as a consequence of their excess and disease, thus starting a new "vicious circle" of drink, poverty, and mental defect, to carry their families down the rapid incline to extinction; but that is the consequence of the effects of the poisons (alcohol, or the toxins of syphilis or tubercle) on the reproductive cells of the parents, and not of environment.—I am, etc.,

ALFRED CLARK, F.R.C.S.Ed.,
School Medical Officer, Hawkes Bay, New Zealand.

Napier, New Zealand, June 1st.

THE DIFFERENTIAL DIAGNOSIS OF SMALL-POX AND CHICKEN-POX.

SIR,—Dr. V. St. John Croley (BRITISH MEDICAL JOURNAL, July 21st) suggests that the most effective method of propaganda in favour of vaccination would be by means of illustrated posters depicting the horrors of small-pox—"the more ghastly looking the better." I wish to point out that the present time is singularly inopportune for propaganda of this character. No doubt, photographs of such cases of small-pox as he has in mind are in existence (I could furnish him with some myself), but they certainly would not be a fair representation of the type of small-pox which is prevailing to-day and about which the present scare is being raised and apart from which this country is so remarkably free from the disease and has been for many years. The present "alastrim" strain of small-pox is so extraordinarily benign in its character that even in unvaccinated persons the "horrors" Dr. Croley wishes to depict are practically unknown. A fair description of the average case occurring, say, at Gloucester would be "a mild attack of influenza followed by an eruption of pimples and free from complications and sequelae." Two or three days in bed during the prodromal stage is usually all the real illness that the patient suffers from. No doubt there is a small proportion of cases which are somewhat more severe, but secondary fever is quite exceptional and it is very rare for the patient to be "pitted." Indeed, at the end of a fortnight the skin is frequently quite clear. Moreover, eye complications, even in unvaccinated children, are almost unknown.

In the interests of veracity it is most desirable that medical men should avoid even the semblance of exaggeration in their advocacy of vaccination. We all deplore the exaggerations of the antivaccinists; let us be very careful not to be guilty of the same fault. Is not the case for vaccination strong enough without being bolstered up by any doubtful methods?

Unfortunately, the lay press, in its anxiety to help the cause of vaccination, often makes the most exaggerated claims and loose statements. There have been many glaring examples of this during the past few weeks. Even the medical press is not quite blameless. Let me quote one instance: Last week an important medical journal published a photograph of a woman with a thick small-pox eruption, and wrote over it: "A case of 'mild small-pox' as at present prevalent in Gloucestershire." In view of the fact that the case in question was one of the very few severe cases which have hitherto occurred at Gloucester, such a statement is certainly misleading.

May I also suggest the desirability of medical men refraining from prophesying evil as the necessary consequence of not taking medical advice? Prophecy is proverbially dangerous, but in connexion with a controversial question like vaccination it is especially so. Medical prophecy in connexion with this question has so often failed to come true that it tends to bring discredit upon the profession and certainly reduces the value of our advice on other questions. How often have we reiterated that if small-pox once got hold on a community where infantile vaccination had been neglected the result would be disastrous and terrible retribution would fall upon the defenceless unvaccinated children. The experience of Leicester in 1904 (307 cases with four deaths) and the present experience of Gloucester, not to mention Nottingham and

other towns, proves that there are other factors besides the presence or absence of infantile vaccination which determine the severity of small-pox. It is too soon yet to pronounce a final verdict as to the lessons of the Gloucester epidemic, but in the meantime I cannot think that Dr. Croley's suggestion is either fair or expedient.—I am, etc.,

Leicester, July 25th. C. KILLICK MILLARD.

SIR,—There is much that is very disturbing about the present small-pox epidemic; it makes many of us look foolish who have been preaching for years to the public on the dangers of small-pox; and it appears to justify some of the contentions of the antivaccinators.

For thirty-five years as medical officer of health here I have been urging vaccination and prophesying regularly that when infection was introduced and a real epidemic started people would have an eye-opener and a terrible reminder of what small-pox means in unvaccinated children, instancing the last Gloucester epidemic with its 413 deaths. Now we have had an epidemic running up to about one thousand cases with practically no mortality, and the majority of these cases is said to have been among unvaccinated persons.

One of the chief arguments of the antivaccinators has long been that small-pox, like typhoid and typhus, has tended to become less severe by reason of ordinary sanitation. Another claim of our "anti" friends is that we beg the question by calling a case small-pox if a child is unvaccinated, and chicken-pox if vaccination marks are clear. In this connexion let me give one instance. A colleague in the public health service, being liable to be called on for an opinion, went to Gloucester and received full instruction about distribution of rash on face and limbs, umbilicated vesicles, initial malaise, lumbar pain, etc., and was finally told, "If you find vesicles on the palms of hands and soles of feet you may call it small-pox." Shortly after he was called in consultation to a case presenting all these features. He gave his opinion "small-pox." As there was still doubt, a medical referee from the Ministry of Health was summoned, and he pronounced it "chicken-pox." When I asked what the reason was for this decision, my friend replied, "Well, the chief thing was that the child had good vaccination scars"!

Undoubtedly much chicken-pox has been, and still is, about. Over six months ago, before the present epidemic in Gloucester, we had a sharp outbreak here, and in the case of some of the children I remarked at the time: "If small-pox were about this child would probably have been sent to the small-pox hospital," but they were unquestionably chicken-pox, with successive crops of vesicles in the same patient.

One recent report I noticed to the effect that out of some 300 cases in one hospital only about 30 had been vaccinated, and yet no fatal case had occurred. If small-pox has become so mild that even in unvaccinated children it does not cause any mortality, we shall surely have to revise all our opinions about the necessity for early vaccination; but does not the whole thing look as if this widespread epidemic had been chicken-pox from first to last?—I am, etc.,

Bromsgrove, July 29th. H. CAMERON KIDD.

SIR,—In a note on the differential diagnosis of small-pox and chicken-pox, Dr. Brand (July 28th, page 160) mentions two signs which he considers are pathognomonic and are "invariably seen in varicella and never observed in variola." He refers to the early vesiculation and crusting of the papules, and the contemporaneous presence of papules, vesicles, and crusts. As an embarkation medical officer in a Mediterranean port, I saw cases of small-pox modified and atypical in which the differential diagnosis tables of the textbook seemed of little use, and also in which the two signs mentioned were not infallible. That an eruption is heterogeneous will not carry great weight, since it may be heterogeneous in small-pox. In cases of small-pox incompletely modified, cases in which the lesions differ considerably in size will differ equally in rapidity of evolution. For this reason want of uniformity among the lesions of some cases of modified small-pox is conspicuous. Ricketts and Byles (*The Diagnosis of Small-Pox*, page 51) state, in discussing modified small-pox, that "papules arrested in development, vesicles, pustules and crusts may all lie together on the same square inch of surface."

The two signs mentioned by Dr. Brand are of the greatest importance, but they are not infallible. Whatever the characters of the skin lesion in small-pox, the distribution is characteristic.—I am, etc.,

Birmingham, July 30th. E. BAYLIS ASH, M.B., M.R.C.P.

ACTIVE IMMUNIZATION IN TUBERCULOSIS.

SIR,—Those who advocate so strongly the use of Spahlinger's methods fail to realize the results obtainable by active immunization with antigens of the tubercle bacillus and of the accompanying infections, reactions being controlled by the exhibition of iodine. The results are remarkable. In my own hands I am accustomed to obtain arrest in over 90 per cent. Turban I, 60 to 75 per cent. Turban II, and 30 to 40 per cent. Turban III. I have several cases of acute pneumonic phthisis alive after four to ten years. I am quite prepared to demonstrate the methods in any suitable institution, under any observation, provided I can nominate my own man to carry out the treatment and keep the patients under treatment as long as I wish. No capital expenditure will be necessary to carry out this demonstration—merely the salaries of the executant doctor and the laboratory expenses for the manufacture of the material. The tubercle bacillus antigen I propose to use is my solution of the tubercle bacillus in benzoyl chloride, preferably made from the patient's own bacilli.—I am, etc.,

W. M. CROFTON.

University College, Dublin, July 30th.

EARLIER NOTIFICATION OF TUBERCULOSIS.

SIR,—The opportunity of following the life history of the patient diagnosed as, or suspected of, tubercle for a number of years in a large industrial area like Leeds in sanatorium, dispensary, and domiciliary consultation work confirms the opinion that our present system of tuberculosis notification is totally inadequate in controlling tuberculosis.

So far notification has only served the purpose of providing a haphazard form of treatment in established disease causing systemic disturbance. Even with modern methods of treatment only in a very small number of cases has the expectation of the life of such consumptives been prolonged for a period of five to seven years in an industrial area. The press and the public clamour for treatment. The aim of notification should be to trace the beginning of the disease and to educate the patient to maintain his resistance, that his expectations of life may be as good as that of a normal individual, and thereby prevent the spread of the disease individually and socially. One has only to glance at the illuminating report of the Chief Medical Officer of the Ministry of Health for facts and figures that cry aloud for radical reforms in our system of notification and diagnosis of tuberculosis. The statistics for 1921 cannot but arouse us from our lethargy.

Tuberculosis of all forms—number of new cases notified to the Ministry	71,702
Tuberculosis of all forms—deaths registered in England and Wales (1921)	42,670
Of these, death from tuberculosis of the respiratory system (73 per 1,000 deaths of all causes)	33,505
Death from bronchitis (73 per 1,000 deaths of all causes)...	33,691
Diarrhœa and enteritis ... ... 37 per 1,000 deaths of all causes.	

The actual causation is not therefore established in the two latter groups, and every practical diagnostician cannot but admit that a fair proportion of these cases in industrial areas are tuberculous, more so than cases wrongly diagnosed as tuberculous. These missed cases and the contacts never come under the vigilance of the tuberculosis staff.

The inference from the facts as to sickness and invalidity in the Ministry's report is equally conclusive. Of 36,325 cases of illness collected by the Regional Medical Officers from 226 insurance practices of 116 towns, tuberculosis was only diagnosed in 505 cases (13.9 per 1,000 of total cases), bronchitis and bronchial catarrh in 7,739 (213 per 1,000). The ratio per 1,000 total cases for pneumonia and other respiratory diseases was 14.8; digestive system 131.2; debility, neuralgia, and headache 55. Here again the

indefinite causation of illness is evident, and tuberculosis as a differential factor in the beginning of disease in a fair proportion of cases is ignored.

The report of our M.O.H., Dr. J. J. Jervis, shows that the Registrar's deaths from bronchitis has fallen in Leeds from 738 in 1915 to 556 in 1921; whilst the fall for death from pulmonary tuberculosis was from 651 to 519. From records of over 880 contacts I personally examined repeatedly at periodic intervals during three and a half years on symptomatic grounds reported by our trained nurse-visitors, 33 per cent. were clinically tuberculous as confirmed by present history. When the definite cases were classified as adults and children under 15, the adults for the last two years gave the high percentage of 67 and children a percentage of 15. Diagnosis in children is admittedly more difficult in the incipient stage, and the estimate, therefore, more guarded.

From the above considerations I submit: (1) That in the interest of a vigorous tuberculosis campaign to the advantage of the patient, all cases of tuberculosis, definite or suspicious, should be notified by all practitioners, whether in private practice or in institutions.

(2) Insured cases certified as bronchitis, anaemia, debility, gastritis for over three months should be investigated by the Regional Medical Officer and the differential diagnosis of tubercle ascertained, if possible, with the aid of an expert from the tuberculosis department. Notification of positive cases and examination of other suspicious contacts could thus be effected.

(3) All contacts with symptomatic history should be periodically examined by an experienced member of the staff whose diagnostic skill is recognized locally and definite cases referred to own doctors and notification enforced.

(4) For notification to be effective it is imperative clinical ability and diagnostic skill should be the paramount qualification for tuberculosis work. The system followed in Birmingham, Sheffield, and partly in Leeds of officers doing dispensary, sanatorium, and domiciliary consultation work is excellent, and wherever possible should be encouraged by the Ministry. By that means after-history will be known and there will be no squabble over diagnosis.—I am, etc.,

Z. P. FERNANDEZ, B.A., M.D.,
July 22nd. Leeds City Tuberculosis Department.

POLYGLANDULAR THERAPY.

SIR,—While the facts in Professor A. J. Clark's lecture on the experimental basis of endocrine therapy (JOURNAL, July 14th, p. 51) are beyond dispute the conclusions drawn are not in accord with clinical experience. Polyglandular therapy has succeeded in some cases where other remedies have proved useless. In my hospital and private practice I have for several years had occasion to treat cases of arthritis occurring in women at or about the climacteric period of life.

The history and type of patient vary considerably from the acute infective polyarticular cases. The patient has always been well and active, looks healthy and well nourished in early cases. She has usually passed the climacteric, and her only complaint is the joint affection. The onset is insidious and the condition tends to progress and in many cases there is great deformity and disability. The joints affected are more commonly the metacarpo-phalangeal and the metatarso-phalangeal (usually the first and second) and the knees. The condition is not often symmetrical and often suggests gout.

It is difficult to find any definite infective foci but of course difficult to exclude the possibility of some slight infection. It has been recognized for some time that there is probably some endocrine deficiency or faulty metabolism in these cases. Treatment in the past has been difficult and disappointing. Vaccines are of little use, stimulating and eliminative measures are certainly helpful, and in some cases thyroid has been of undoubted efficacy.

For some time I have been using a pluriglandular preparation in these cases and it has certainly proved most useful. As the mortality of this form of arthritis is almost *nil* definite evidence is lacking as to the exact condition of the ductless glands in these cases, but we know that the ovaries and thyroid often atrophy at that time and that substitution therapy is indicated. If results are favourable there is a great deal of experimental work to be done to confirm the facts.

Leonard Williams, in his paper in the JOURNAL of June 16th, refers to arthritis as a deficiency disease, due to exhaustion of the endocrine glands as the result of toxaemia and lack of vitamins in the diet.

The whole subject is complex and it is only necessary to read the report of the discussion on rheumatoid arthritis at the meeting of the Royal Society of Medicine on April 23rd to realize how vague are our ideas as to the cause of these conditions, and although polyglandular therapy does not get to the root of the matter it is of undoubted utility in combination with other treatment.—I am, etc.,

FLORENCE THEOBALDS,
July 15th. Honorary Physician, Devonshire Hospital, Buxton.

ETHER *VERSUS* CHLOROFORM.

SIR,—Dr. D. W. Samways asks us who specialize in anaesthetics to "teach the student how to administer chloroform safely and properly and ether reasonably." That is what we are daily employed in doing. Reasonable use of ether means that ether should be the routine anaesthetic for major surgery; safe and proper use of chloroform means that this drug is used solely for certain special cases. If Dr. Samways believes that chloroform can be safe as a routine anaesthetic, will he explain how it is that almost all those who constantly use anaesthetics have replaced it as the routine drug, and also how it is that there has never yet been an administrator of wide experience, so far as I am aware, who has not caused death by chloroform? With one interrogation of Dr. Samways, however, I beg warmly to associate myself, and that is where he says, "Why should our patients be handed over to unskilled persons to anaesthetize?"—I am, etc.,

London, W.1, July 30th. J. BLOMFIELD.

SIR,—From the correspondence on ether *versus* chloroform reference to the experimental work of Levy with chloroform, administered to cats, is absent. To quote Sir Thomas Lewis's opinion of Levy's research—"His work upon this subject is a landmark in the history of research upon death under chloroform." Quite briefly stated, Levy's two main conclusions are as follows:

(1) Death during administration of chloroform to cats is almost always due to *ventricular* fibrillation, which is also the cause of death in the majority of chloroform fatalities in the human subject.
(2) These fatalities are especially liable to occur "in the induction stages or at other periods when the saturation of blood with chloroform is relatively low."

The latter conclusion, based upon very careful and convincing research, would seem to take the wind out of the sails of those who strongly advocate the safety of chloroform "given with a light hand."—I am, etc.,

Reading, July 22nd. GORDON LAMBERT.

DYSPNOEA IN CARDIO-VASCULAR DISEASE.

SIR,—I read with interest the article of Dr. Jonathan Meakin, M.D., on "Dyspnoea in Cardio-vascular Disease" (B.M.J., 23.6.23). There are many details of his article with which I do not agree. But his assertions, *re* Cardiac Failure, "there is a sharp decline in the out-put of the ventricle per beat; instead of expelling 100 c.c. per beat the ventricle may only expel 15 c.c. to 25 c.c. per beat; in such circumstances the ventricle on each contraction does not completely empty itself and consequently there is a residue of blood left in the ventricle at the beginning of diastole. As the amount of this residue increases so the symptoms of Cardiac Failure become more pronounced." I believe Dr. Meakin is mistaken in these views. In a booklet I brought out ("Original Observations in Cardiac Disease," 1/3d., Cornish Bros., Bmham.) in April, 1920, I there gave an account of what I term "Fractional Heart Contractions." If I might use a simile I can explain Fractional Heart Contractions clearly and briefly:—Imagine a ladder with 20 rungs (number 1, 2, 3, 4, 5, etc. from the bottom to the top) placed at the side of a house, and a bucket (manipulated by a rope and pulley) hoisted

up (representing ventricular diastole) and *down* the ladder (representing ventricular systole); normally (i.e. normal ventricular cycle) the bucket goes up to the top and down to the bottom of the ladder; but abnormally (i.e. Fractional Heart EXPANSION and CONTRACTION) the bucket may only go up 3 or 5 or 7 or 8 etc. rungs and then come sharply down to the bottom again. On the other hand the bucket may go up to the top (20th rung) of the ladder (i.e. full ventricular diastole) and then only come down to the 15th or 14th or 12th etc. rung (representing Fractional ventricular Systole) before going up to the top again. These "bottom" Fractional beats e.g. (1st to 5th rung) and "top" Fractional beats e.g. (20th to 15th rung) represent two types of Fractional contractions at either end of the Cardiac cycle scale, occur more or less indiscriminately in Cardiac failure, are irregular and mixed with occasional complete ventricular systole and diastole. Fractional contractions are in my opinion Nature's far-seeing efforts to rest the Heart muscle for the complete heart-contraction which it wants to give every time. I disagree with many other assertions of Dr. Meakin about the Heart but I don't like 5 minutes letter writing to put my views into what it took me 5 years' study of the Heart to find out. Perhaps if Dr. Meakin studies my booklet it may shed new light on the heart for him.—Yours sincerely,

MICHAEL BERCHMANS SHIPSEY, M.B., B.Ch.

408, Slade Road, Erdington,
Birmingham, 25.6.23.

THE EXPERIMENTAL INQUIRY INTO THE CAUSES OF CANCER.

SIR,—I have read with the greatest interest the very able article on cancer by Dr. Leitch of the Cancer Hospital Research Institute (July 7th, p. 1).

It displays the broadest and most searching induction I have come across for a long time. It is bound to be of great service to those whose time and opportunities do not permit them to pursue such experiments as fall to the lot of Dr. Leitch and his colleagues.

There is one point throughout all the experiments with externally applied irritants which strikes me forcibly—namely, that they produce only epitheliomatous conditions. Do those locally produced epitheliomata later on produce constitutional cancer which may become diffused independently of the locally induced cancer?

I can quite understand locally induced cancer spreading and producing poisonous effects, but not in the same manner as other cancers. In my opinion, locally induced cancer is caused by the long continued exclusion of the air and the enclosure of epithelial excretion which destroys the cells and is bound to produce a backward tendency of the poison produced. This is shown by the influence produced by the irritant continuing to travel after the irritant has ceased to be applied. In my opinion its method of attack is similar to syphilis, which takes a definite time to reach the germ plasm before it expresses itself on the skin, and it is rather curious that syphilis first attacks the same part of the germ plasm which is associated with all cancers. They seem to reach the germ plasm by something like a retrogressive contiguity. In my opinion all cancers are a reversion towards an embryonic condition. The nearer the cancer cells are to embryonic cells the more rapid the progress of the disease.—I am, etc.,

Bolton, July 16th. A. W. CRAWFORD, M.B., C.M.

THE Accademia Medico-Fisica of Florence is preparing to celebrate next year the hundredth anniversary of its foundation; it is proposing to publish a souvenir volume giving the history of the progress of medicine as reflected in the proceedings of the society.

APPLICATION has been made by the State attorney-general of Richmond, Virginia, U.S.A., for revocation of the charter of the "Oriental University" of Cherrydale, Virginia. It is said that the federal authorities of the United States have had this "school" under observation for some time, and that if its charter is revoked the institution will be prosecuted for using the Post Office mails to defraud. Apparently degrees of all kinds are being sold both in the United States and abroad, and the names of prominent men now dead have been included in the university staff. The head of the "school" claimed, it is said, that by virtue of his ability as a medium he could get into touch with these dead members of the staff.

Universities and Colleges.

CONJOINT BOARD IN ENGLAND.

DIPLOMA IN LARYNGOLOGY AND OTOLOGY.

THE following regulations for the Diploma in Laryngology and Otology (D.L.O.R.C.P. and S.Eng.), drawn up by the Committee of Management of the Examining Board of the Royal College of Physicians of London and Royal College of Surgeons of England, after conference with various teachers in the subjects, have been approved by both Colleges and have now come into effect.

REGULATIONS.

I. Both parts of the examination will be held in the months of June and December.

II. The examination shall comprise:

Part I. (*a*) The anatomy, embryology, and physiology of the ear, nose, pharynx and larynx. (Candidates will be expected to be acquainted with the vascular, lymphatic, and nervous connexions of these parts and with the central nervous system in so far as it relates to the special regions concerned.) (*b*) Elementary acoustics.

Part II. (*a*) The recognition and use of special instruments and appliances. (*b*) The medicine, surgery, and pathology of the ear, nose, pharynx, and larynx.

III. The examination will be written, oral, and practical in Part I, and written, oral, practical, and clinical in Part II.

IV. Candidates may enter for Part I of the examination at any time after a registrable qualification in medicine, surgery, and midwifery has been obtained. (Candidates must present themselves for the whole of Part I. In the event of failure in one division only, candidates will be allowed to present themselves for re-examination in that division.)

V. Candidates may enter for Part II of the examination on the completion of one year of special study of diseases of the ear, nose, pharynx and larynx, after a registrable qualification in medicine, surgery, and midwifery has been obtained, provided that Part I has been previously passed, and on production of the following certificates:

(*a*) Of having attended the laryngological and aural clinical practice of a recognized hospital or of the laryngological and otological departments of a recognized general hospital for twelve months. (The conditions of this certificate (*a*) will be fulfilled by holding the appointment as house-surgeon or house-physician or as clinical assistant at one of the above hospitals or departments, provided that in the case of a clinical assistant the certificate shows that he has attended for at least three hours a day on two days of the week.)

(*b*) Of having attended operations to the satisfaction of the surgeons in charge.

(*c*) Of having received instruction in pathology and bacteriology with special reference to laryngological and otological medicine and surgery.

VI. The fee for admission or readmission to each part of the examination is £6 6s.

VII. Candidates must give fourteen days' notice in writing of their intention to present themselves for examination, to the Secretary at the Examination Hall, 8–11, Queen Square, Bloomsbury, London, W.C.1. In the case of Part II the necessary certificates of study must be produced with the notice.

VIII. Graduates in medicine or surgery of Indian, Colonial, and foreign universities recognized by the Examining Board in England, but whose degrees are not registrable in this country, may enter for the examination for the Diploma in Laryngology and Otology on fulfilling the same conditions in regard to study.

IX. The above conditions of study may be modified at the discretion of the Committee of Management in the case of a candidate (*a*) who has carried out original investigations, or has written a thesis on some subject in laryngology or otology; (*b*) whose studies have extended over a prolonged period of time without fulfilling the exact conditions; but exemption will not be granted from any part of the Examination.

Syllabus of the Examination.

The Ear.—Congenital deformities. Wounds and injuries. Foreign bodies and parasites. Acute and chronic inflammations and their complications. Oto-sclerosis; tuberculosis; syphilis. Simple and malignant new growths. Varieties of deafness, including deaf-mutism—vertigo—tinnitus. Tumours of the auditory nerve. Malingering.

The Nose and Pharynx.—Congenital deformities. Injuries and foreign bodies. Acute and chronic inflammation; vasomotor rhinitis; retro-pharyngeal abscess. Nasal obstruction; adenoid growths. Acute and chronic inflammation of the nasal sinuses. Diseases of the tonsils. Tuberculosis; syphilis. Simple and malignant new growths.

The Larynx.—Congenital deformities. Injuries and foreign bodies. Acute and chronic inflammation. Disorders of innervation, sensory and motor. Tuberculosis; syphilis. Simple and malignant new growths.

Note to Syllabus.—Candidates will be examined on radiograms; and also will be expected to recognize under the microscope and growing in or on nutrient media the organisms common to infections of the above regions.

For Part I two examiners will be appointed by the Royal College of Surgeons; for Part II one examiner will be appointed by each College.

The Committee will, subject to an annual report to the Colleges, determine the courses to be specially recognized as fulfilling the conditions of the Regulations.

Examination in Anatomy and Physiology.

Under the new regulations candidates who commenced their professional studies after January 1st last will be allowed to pass in anatomy and physiology separately, provided that they attain not less than half the number of marks required to pass in the other subject. In future the same privilege will be extended to candidates under the old regulations.

ROYAL COLLEGE OF PHYSICIANS OF LONDON.

An ordinary quarterly Comitia of the Royal College of Physicians of London was held on Thursday, July 26th, the President, Sir Humphry Rolleston, being in the chair.

Members.

The following candidates, having passed the required examinations, were admitted as Members:

Frances Braid, M.D.St.Andrews, Robert Alexander Chambers, M.D. Edin., Edward Ffolliott Creed, M.B.Oxon., Samuel Whately Davidson, M.D.Durh., Sidney Campbell Dyke, M.B.Oxon., Horace Sharman Le Marquand, M.D.Lond., L.R.C.P., George Reid McRobert, M.D.Aberd., Oswald Marriott, M.D.Lond., L.R.C.P., William Moodie, M.D.St.Andrews, William John Morrish, M.D. Lond., L.R.C.P., Elizabeth O'Flynn, L.R.C.P., Adam Patrick, M.D.Glasg., Gerald Maurice Joseph Slot, M.D.Lond., L.R.C.P., George Herbert Sowry, M.D.Lond., L.R.C.P., William Benjamin Batchelor Taylor, M.B.Durh., George Duncan Whyte, M.B.Edin., Wilfrid Burton Wood, M.B.Camb., L.R.C.P.

Licences.

Licences to practise Physic were granted to the following 193 candidates who had passed the required examination and conformed to the by-laws and regulations:

P. M. Acheson, N. F. Adeney, *Katharine M. Andrew, W. A. Atkins, G. F. Axon, S. C. Bakhle, W. E. Barnie-Adshead, A. A. Battson, A. Beauchamp, *Susanna M. Bernard, D. H. Berry, J. Bevan-Jones, T. S. Blacklidge, *Nina O. Bohtlingk, E. R. Boland, W. B. Boone, J. C. Bose, J. A. Brew, *Enid A. Brock, R. Brooke, S. N. Browne, W. A. Caldwell, R. H. Carter, E. H. P. Cave, N. E. Chadwick, J. H. K. Clarke, L. T. Clarke, J. E. Clegg, E. C. T. Clouston, L. Collins, G. G. Cooke, N. B. Cooke, V. Cotton-Cornwall, R. S. Creed, *Cecily D. Crosskey, J. A. Currie, G. C. W. Curson, W. Dabbs, C. K. David, A. B. Davies, K. S. Dickinson, M. A. Distaso, G. A. Dolman, *Helen M. Du Buisson, G. Dudley, A. D. Dyson, F. Earlam, H. C. Edwards, A. J. C. Eland, H. N. K. Elphick, R. H. Enoch, *Ursula E. Eva, G. M. Evans, H. Evans, J. L. Faull, A. E. Fergusson, *Mary D. Fletcher, K. Fletcher-Barrett, Mary E. Fox, *Emily L. Franklin, N. G. C. Gane, C. E. Gautier-Smith, G. F. Gibberd, A. D. Gladish, N. M. Goodman, R. Goodman, A. Gordon, B. W. B. Gordon, W. A. Gornall, A. W. Gott, S. A. Grant, E. H. Griffin, G. E. R. Hamilton, A. G. Hammond, *Tatiana I. Hardy, A. J. Hawe, M. Hawke, B. D. Hendy, *Gladys Hill, *Nancy W. Holloway, M. Honigsberger, *Mary D. Horton, *Phyllis M. Horton, L. G. Housden, E. R. Hughes, J. T. Ingram, W. O. C. Jarratt, S. W. Jeger, J. Jemson, B. H. Jones, N. A. Jory, *Winifred A. Kane, *Hilda M. Kennedy, M. E. P. Killard-Leavey, G. L. S. Kohnstam, D. Kostitch, *Emilia B. M. Krause, K. H. Lachlan, R. E. Lane, T. Latham, H. V. R. T. Lauder, B. J. Leggett, M. M. Lewin, J. L. Lewthwaite, Carlos E. M. J. Libert, L. O. Lindsay, P. M. Lissack, W. A. Lister, B. S. Llewelyn, J. I. Lyons, C. C. Mahoney, L. P. Marshall, C. A. Martin, *Dorothy E. Mason, H. R. Matthews, *Margarethe Mautner, J. Maxwell, *Margaret S. Mills, *E. B. Moffat, W. B. R. Monteith, J. W. Morledge, A. C. Mowle, J. D. R. Murray, L. Mushin, A. Nathan, M. Newfield, E. Obermer, H. L. Oldershaw, *Carrie H. Osmond, C. L. Ousep, E. D. Owen, J. N. J. Pacheco, *Louise O. Paterson, R. T. Payne, J. Pearce, *Florence M. Pearson, G. G. Penman, R. P. Perera, A. C. T. Perkins, L. P. Phillips, J. W. Poole, T. H. I. Potts, A. T. W. Powell, C. K. Rau L. Reuvid, *Esther M. E. E. Rickard, R. Riley, J. Roberts, M. Robinson, T. E. Ryves, L. H. Savin, J. M. Schofield, H. Seelenfreund, W. P. H. Sheldon, R. W. Smith, A. J. Smyth, F. A. R. Stammers, *Doris M. Stone, R. V. Storer, G. R. M. Swan, R. G. Tame, H. C. C. Taylor, H. A. Thomas, T. B. Thomas, G. L. Thompson, J. H. Thompson, G. K. Thornton, P. Thwaites, *Doris Todd, N. C. Tughan, F. S. Vaughan, A. L. Walker, E. G. L. Walker, *Hygeia L. J. Wallace, M. H. Webb-Peploe, *Ethel Whitby, N. L. White, *Joan F. Whitelock, A. K. Wiggins, E. G. Wilkinson, H. C. M. Williams, R. E. Wilson, R. K. Wilson, I. E. Wolf, *Edith V. Wood, E. Wornum, J. T. Wybourn, H. D. Wyse, *Mildred M. E. Yate, B. B. Yodh, *J. P. Yeoman, B. Zeitoun, L. S. V. Zinober.

* Under the Medical Act, 1876.

Diplomas.

Diplomas in the subjects indicated were granted in conjunction with the Royal College of Surgeons to the following candidates:

PUBLIC HEALTH.—P. N. Basu, W. T. G. Boul, L. G. Bourdillon, F. A. J. Brodziak, Maude C. Cairney, A. W. Carleton, A. A. Cockayne, Katherine M. L. Gamgee, E. Hesterlow, N. H. Linzee, Muriel J. Lough, D. W. McKay, J. L. Pawan, S. L. S. Pearson, G. L. Ranking, H. Singh, G. M. J. Slot, J. Sullivan, M. L. Talwar.

TROPICAL MEDICINE AND HYGIENE.—J. W. F. Albuquerque, A. H. Baldwin, J. Donald, G. V. Gollerkeri, A. J. Keevil, A. N. Kingsbury, F. McCallum, C. McIver, E. J. Pampana, E. Peterson, W. J. E. Phillips, J. L. Rebello, A. Salama, N. S. Sethi, W. H. Simmons, D. J. Valentine.

OPHTHALMIC MEDICINE AND SURGERY.—M. Baranov, T. Butler, R. Colley, T. Colley, M. A. M. El-Kattan, J. G. F. Heal, P. C. Livingstone, Brenda A. Mitchell, Z. Schwartz, S. D. Sondhi, N. L. Varma.

PSYCHOLOGICAL MEDICINE.—Y. Abul-Nasr Barrada, T. M. Davie, T. L. Edwards, M. K. El-Kholy, F. R. Martin, Eveleen B. G. Rivington, G. W. Shore, P. M. Turnbull.

College officers, members of committees, and examiners were appointed on the nomination of the President, the Council, and the Library Committee:

Censors: Dr. John Fawcett, Dr. Herbert Morley Fletcher, Lord Dawson of Penn, Dr. E. Farquhar Buzzard.

Emeritus Treasurer: Sir Dyce Duckworth, Bt., M.D. Treasurer: Dr. Abney Phillips.

Examiners.

Chemistry.—William Bradshaw Tuck, D.Sc., Charles Stanley Gibson, B.Sc., F.C.S.

Physics.—Frederick Womack, M.B., B.Sc., William Edward Curtis, D.Sc.

Practical Pharmacy.—Alfred Ernest Russell, M.D., Edward Alfred Cockayne, M.D., Philip Hamill, M.D., Alfred Joseph Clark, *M.C.*, M.D., Walter Ernest Dixon, M.D., F.R.S.

Physiology.—John Beresford Leathes, M.B., John Mellanby, M.D.

Anatomy.—Thomas Baillie Johnston, M.B.

Medical Anatomy and Principles and Practice of Medicine.—Sir Archibald E. Garrod, K.C.M.G., M.D., John Hannah Dryedale, M.D., Arthur Philip Beddard, M.D., William Cecil Bosanquet, M.D., James William Russell, M.D., Charles Richard Box, M.D., Sir James Purves-Stewart, K.C.M.G., M.D., Charles Bolton, M.D., Lewis Albert Smith, M.D., Sir William Henry Willcox, K.C.I.E., M.D.

Midwifery and Diseases peculiar to Women.—John Prescott Hedley, M.B., Sir Ewen John Maclean, M.D., Thomas George Stevens, M.D., John Davis Barris, M.B., Henry John Forbes Simson, M.B.

Public Health.—Part I: Henry Wilson Hake, Ph.D. Part II: David Samuel Davies, M.D.

Tropical Medicine.—Sir Percy William Bassett-Smith, K.C.B., C.M.G. (Bacteriology), Sir Leonard Rogers, C.I.E., M.D. (Diseases and Hygiene of the Tropics).

Ophthalmic Medicine and Surgery.—Gordon Morgan Holmes, C.M.G., C.B.E., M.D.

Psychological Medicine.—Part I: Henry Devine, M.D. Part II: James Taylor, M.D., Charles Hubert Bond, M.D.

The following communications were received:

1. From Sir Thomas Barlow, a former President, to the retiring Treasurer, Sir Dyce Duckworth, offering £1,000 as a gift to the general Funds of the Royal College of Physicians in view of the probability of necessary alterations to the College buildings. The offer was gratefully accepted and a most sincere vote of thanks was accorded to Sir Thomas Barlow for his great generosity.

2. From Dr. R. W. Innes Smith offering for the acceptance of the College a portrait of Sir Charles Scarburgh. The Harveian librarian, Dr. Arnold Chaplin, explained that two portraits of this distinguished physician were known to exist, and this was one of them. The offer was gratefully accepted and the thanks of the College were voted to Dr. Innes Smith (see p. 197).

The Baly Medal was awarded to Mr. J. Barcroft, F.R.S., and the Bisset Hawkins Medal to Dr. T. M. Legge, C.B.E.

The College placed on record its deep regret at the death of Mr. William Fleming, and its high appreciation of his faithful and valuable services, which extended over fifty years, during thirty years of which he held the office of Bedell.

A committee was appointed to consider and report on the question of increasing the accommodation of the College and on the best way of doing so should it prove desirable.

An application from Dr. Philip H. Wells for the restoration of the membership, resigned by him in January, 1922, was granted.

UNIVERSITY OF EDINBURGH.

HONORARY DEGREES.

IN connexion with the eleventh International Physiological Congress at Edinburgh a special graduation ceremony was held on July 25th, when the following eight distinguished physiologists received the Honorary LL.D. degree. The presentations were made by Sir Edward Sharpey Schafer, who in each case gave a short account of the work of the new honorary graduate.

Of Dr. FILIPPO BOTTAZZI he said that as Professor of Physiology in the Royal University of Naples he had at his disposal the resources of the famous aquarium and had known how to utilize them to the advantage of comparative physiology. There were few subjects in the realm of physiology Professor Bottazzi had not attacked, and whatever he had approached he had illuminated. His researches on the heart and circulation, on the alimentary tract, and on the physiology of the muscle, both plain and striated, and on its innervation, were familiar to physiologists. Recently he had undertaken the thankless task of editing a new journal of physiology, which was all that such a journal should be.

Of Professor WILLIAM HOWELL he said that during a long tenure of the chair of physiology in the Johns Hopkins University, Baltimore, he had shown his capacity to conduct the most difficult and intricate investigations, extending over a wide range, including investigations of the blood and its coagulation, of the action of the nerves to the heart, of the effect of brain stimulation on blood pressure, and of the physiology of the pituitary body.

The Senatus desired to cement the bonds between Edinburgh and Leyden by conferring an honorary degree on Dr. WILLEM EINTHOVEN, Professor of Physiology in the University of Leyden. By his invention of the string galvanometer he had done more than anyone since Laënnec, the inventor of the stethoscope, to elucidate the action of the heart in health and disease.

The work of Professor JOHANSSON of Stockholm had been concerned mainly with the nerves of the heart and blood vessels and with the effect of muscular exercise on bodily functions; he had also carried out investigations into the metabolism of carbohydrates and the regulation of the temperature of the animal body.

Professor ALBRECHT KOSSEL of Heidelberg, by his researches on the simplest proteins, the so-called protamines, had extended knowledge of the chemical structure of these all-important constituents of the body, and physiologists were indebted to him for having trained some of the best physiological chemists.

Professor HANS MEYER of Vienna was a pharmacologist, but to be a pharmacologist a man must first be a physiologist. There was no system of the body which he had not investigated as to the action of drugs—muscle, blood, central nervous system, sense organs, heart, respiration, alimentary canal, and kidneys.

Professor CHARLES RICHET, President of the Congress when it met in Paris three years ago, was a worthy successor and disciple

of those great French physiologists Bernard, Pasteur, Marey, and Chauveau. His researches on the physiology of muscle and nerve, on respiration, on the mechanism of the flight of birds, on immunity, fermentation, and numerous other subjects would, in any case, have placed him in the first rank of experimental physiologists. But the crowning discovery of his physiological career was the production of anaphylaxis. Professor Richet's original experiment might be described as of quite a humble nature. He had made an extract from the tentacles of a sea anemone and injected a small amount of this extract into mammals. The effect of the first injection had been almost *nil*, but on repeating the dose some weeks later a condition of profound shock had resulted, followed in many cases by death. Such an effect had been known to occur after the injection of serums in the prophylactic treatment of disease, and although the causation of anaphylaxis was not yet completely understood, Richet's experiments had greatly helped towards its elucidation and had opened up an entirely new field to the pathological physiologist.

There was no more famous name in modern physiology than that of IVAN PETROVICH PAVLOV. His investigations upon the digestive organs and the conditions under which the secretions act upon the food were poured out marked an epoch in the physiology of this subject. Previous to his work little or nothing was known of the nervous mechanism regulating the secretion of gastric and pancreatic juice. Pavlov's investigations threw a flood of light upon a hitherto obscure subject and formed the starting point for all future work upon it. A still more remarkable series of researches were those dealing with the so-called "conditioned reflexes." Pavlov had shown in his earlier researches that psychical influences had an important and strictly measurable effect upon the flow of both saliva and gastric juice, but his experiments penetrated a long way further into the obscure region which connected physiology and psychology.

ROYAL COLLEGE OF SURGEONS OF EDINBURGH.

THE following fifteen successful candidates, out of forty-six entered, who passed the requisite examinations, have been admitted Fellows:

T. Ahmed, R. C. Begg, W. E. R. Coad, A. Denham-White, M. J. Gibson, C. Gill-Carey, H. M. Godfrey, A. W. Harley, F. Harvey, A. T. Hawley, N. E. Kendall, J. S. Lloyd, D. M. MacLeod, Gladys H. Marchant, L. D. Mercer.

D. N. Bhaduri and H. C. van Dort have been admitted Licentiates.

Obituary.

G. I. THOMPSON STEWART, M.A., M.D.,

M.O.H. East Suffolk.

WE regret to announce the death, which took place suddenly on July 15th, of Dr. George Irvine Thompson Stewart, second surviving son of the late Sir David Stewart of Banchory-Devenick.

Dr. Stewart, who was 51 years of age, graduated M.A. Aberdeen in 1893, M.B., C.M. in 1896, B.Sc. with highest honours in medical sciences in 1899, and M.D. in 1912. After holding the appointment of senior house-physician under the late Dr. Angus Fraser Dr. Stewart went in for surgical work in the hospitals in London, Berlin and Vienna; he took the F.R.C.S.Eng. in 1906. He was the chief assistant for three years in the throat department of St. Thomas's Hospital, and senior clinical assistant at the Throat Hospital, Golden Square. As house-surgeon and surgical registrar at the Great Ormond Street Hospital for Sick Children Dr. Stewart became interested in children, and was appointed in 1908 school medical officer for East Suffolk. His work there received special commendation from the Board of Education, and his annual reports have been extensively quoted in the Blue Books issued by the Chief Medical Officer of the Board. In 1911, after taking the D.P.H., he was appointed county medical officer of health as well. He threw himself with characteristic energy into the work of his departments. He was genuinely admired by his staff and colleagues not alone for his outstanding abilities as a public administrator but as a man of generous heart and disposition, ever ready to spend himself in the interests of others and to promote and foster good fellowship among the staff engaged in the service of the county.

As secretary of the South Suffolk Division of the British Medical Association he put the branch on a firm footing and his loss will be greatly felt. In 1917 he became adjutant of the local unit of the R.A.M.C. (Vol.), and later when the Defence Force was created he assumed charge of the R.A.M.C. sanitary section.

FLORA MURRAY, C.B.E., M.D., D.P.H.

THE death of Dr. Flora Murray on July 28th, in her 56th year, removed one who will long be held in grateful remembrance by the sick and wounded who were under her care during the great war. Dr. Murray was a student at the London (Royal Free Hospital) School of Medicine for Women, and at the Royal Infirmary, Newcastle. She qualified in 1903 with the M.B., B.S. degrees of Durham University, proceeded M.D. in 1905, and she obtained the D.P.H.Cambridge in 1906. Dr. Murray was especially interested in children and held the appointment of physician to the Harrow Road Children's Hospital, and was also clinical assistant at the Belgrave Hospital for Children. She wrote an article on ethyl chloride as an anaesthetic for infants, in the *Lancet*, 1905, and was anaesthetist at the Chelsea Hospital for Women. In 1912 she was one of a group of eager women who started the little Hospital for Children in Harrow Road.

As soon as war was declared Dr. Flora Murray, together with Dr. Louisa Garrett Anderson organized plans for helping, and gathered round them other enthusiastic women. The immediate result of these plans was the formation of the Women's Hospital Corps, which was the first of the women's voluntary units. Although the corps consisted originally of only twenty members—doctors, orderlies, and nurses—their offer of help was readily accepted by the French Government and work was immediately started in Paris. Later, the corps was asked to start a hospital of 200 beds at Wimereux; this hospital was afterwards taken over by the R.A.M.C. Sir Alfred Keogh then proposed to the corps the organization of a women's military hospital of 550 beds in London. The old St. Giles's Union Workhouse in Endell Street was taken over and equipped, Dr. Flora Murray being placed in charge. The medical staff were graded for pay as members of the R.A.M.C., women orderlies were employed, nurses being attached to the Q.A.I.N.S. The work which was achieved by this hospital and by the corps previously is recorded in Dr. Flora Murray's book published in November, 1920, entitled, *Women as Army Surgeons: being the History of the Women's Hospital Corps in Paris, Wimereux, and Endell Street, September, 1914, to October, 1919.* The official recognition of her services was the award of the C.B.E. The affectionate gratitude of the sick and wounded soldiers who passed through her hands is a great testimony to Dr. Murray's work.

Medical News.

THE Rockefeller Foundation has arranged to present to the German universities five copies each of the principal British and American medical journals. One copy will be given to the State library of Berlin or Munich and the other four will be distributed among four groups in the north, south, east, and west of Germany, each of which contains five or six universities. A journal will remain in the library of each university for two months.

A NEW medical periodical, the *British Journal of Anaesthesia*, appeared at the end of last month. It is conducted by an editorial board of twelve anaesthetists in various centres in Great Britain and is edited by Dr. H. M. Cohen, anaesthetist St. Mary's Hospitals, Manchester. It is to be published quarterly by Messrs. Sherratt and Hughes of Manchester. The annual subscription is £2, post free; the price of single copies is 10s. 6d. The first number contains 54 pages, and consists of original articles and abstracts, and a bibliography of current literature; there are also some notes on societies. One of the papers is by Drs. Gwathmey and E. P. Donovan of New York. It deals with painless childbirth by synergistic methods. By "synergistic anaesthesia" is meant "the reciprocal augmentation of the action of one or more drugs upon one another with unconciousness." "Synergistic analgesia" is the term employed when consciousness is present. Dr. Gwathmey states that when the agents are properly selected and used the "effect is much greater than the simple summation of their pharmacological action." The aim appears to be the diminution of pain without loss of consciousness. The solution is administered by the rectum and is believed to reach the colon. A number of formulas are given. That which appears to be preferred contains urea 1 per cent.

magnesium sulphate 2 to 3 drachms, morphine sulphate 1/4 gr., hyoscine hydrobromide 1/100 gr., and glucose 4 drachms, with distilled water to 2 oz. The mixture is heated to 110° F. and given as a retention enema. If followed by an injection of ether 1½ oz. and oil 6 drachms, it can be used for surgical cases.

A NEW quarterly journal for the publication of original papers in experimental biology, to be called the *British Journal of Experimental Biology*, is announced by Messrs. Oliver and Boyd, of Edinburgh, with Dr. F. A. E. Crew, Director of the Animal Breeding Research Department, Edinburgh University, as managing editor; he will have the assistance of a strong editorial board. The annual subscription will be 40s., post free.

AT the June matriculation examination of the University of London 130 candidates were successful in the first division and 1,030 in the second division; in addition, 47 took the supplementary certificate for Latin.

A CIVIL LIST pension of £75 has been awarded to Miss Bacot in recognition of the services of her brother, the late Mr. Arthur W. Bacot, entomologist to the Lister Institute of Preventive Medicine, who died in Cairo last April from typhus fever contracted in the course of experimental research into the disease. A pension of the same amount has been awarded to Mr. Morley Roberts, the novelist, who has written well on certain biological and pathological problems.

SOME curious statements were made at the fifty-ninth annual conference of the National Association of Medical Herbalists of Great Britain, Ltd., which was held at Sheffield last month. The president said that the association's energies had been directed to two main objects—the progress of the Medical Herbalist (Registration) Bill, and education. They were determined to give the House of Commons no rest until the public obtained that medical freedom they had a perfect right to demand—the freedom to be attended by the medical herbalist without fear or detriment. For years the people of England, and especially those in authority, had been dominated by the opinions of the medical fraternity, and there was real danger and menace in the recently revived prophylactic vaccination for small-pox. A member proposed that a special fund should be opened for cancer investigation by herbalists, but the feeling was that the association had neither the money nor the equipment to carry it on. A telegram was sent to Commander Kenworthy thanking him for his work in connexion with the registration bill. This parody of a scientific meeting shows how subjects of medical interest may be picked out and unfounded assertions made regarding them. The identity may be questioned of the "responsible member of the Government" who informs herbalists that the authority of the medical profession is on the wane—unless, perhaps, Commander Kenworthy is disguised under this description.

THE fifth annual general meeting of the Association of Certificated Blind Masseurs was held on July 19th at the National Institute for the Blind. Sir Robert Jones, the president of the association, drew attention to the council's excellent report of the year's work. Mr. C. Mansell Moullin, Mr. A. H. Tubby, and Mr. Harry Platt, vice-presidents of the association, were also present.

THE Home Secretary has amended the regulation under the Dangerous Drugs Act, 1920, with reference to the supply of drugs to the masters of merchant ships. The new regulation, which is to come into force forty days after July 24th, authorizes the master of a foreign ship in any port in Great Britain to purchase a supply of any of the drugs to which the Act applies in order to complete the necessary equipment of the ship. The quantity so purchased will be subject to the certificate of the medical officer of the port and must not exceed what is required for the use of the ship until it next reaches its home port.

AT the recent examination held by the National Health Society fifteen women passed for health visitors and infant welfare workers; eight women trained by the society passed at the last examination of the Sanitary Inspectors' Board.

MR. W. G. OAKLEY has been awarded a Tancred Studentship in Physic at Gonville and Caius College, Cambridge.

A MEETING of Rotarian pharmacists was held recently at the Hotel Great Central, London, during Conference week. Dr. Thomas Stephenson of Edinburgh occupied the chair, and the meeting was representative of all parts of the country. The chairman opened a brief discussion on Rotarianism as applied to pharmacy. He pointed out that as the section was a professional one and included the allied professions of medicine, dentistry, veterinary surgery, and chemistry, one of the first objects of the section should be the promotion of friendly relations between these professions. Whether or not that should be done by the drafting of a code for submission to the representative bodies—the Pharmaceutical Society and the British Medical Association—remained to be seen, but he felt very strongly that the establishment of such relations should be their first object. The chairman further pointed out that the governing principle of Rotary—namely, service to the community—should be the basis of all work in pharmacy, and if this principle were applied to many controversial questions it would be found that these questions were capable of easy solution. It was only when the question of profit arose that difficulties were encountered. In the discussion which followed the opinion was expressed that until a joint meeting with the medical portion of the section could be held it would be futile to discuss the question of relations between physicians and pharmacists. The meeting, however, endorsed the chairman's view that such should be one of the principal objects of the section.

AN English translation of *The Internal Secretions of the Sex Gland*, by Dr. A. Lipschütz, professor of physiology in the University of Dorpat, Esthonia, will shortly be issued by Messrs. Heffer and Sons, Cambridge. Dr. F. H. A. Marshall, F.R.S., of Christ's College, Cambridge, has written a foreword.

AN ordinary medical post-graduate course will begin in Vienna on September 1st; a course of the kind is now in progress. A special course will be given from September 17th to 29th. Copies of the programme and further particulars can be obtained on application to the Secretary of the Austrian Embassy, 18, Beaulieu Square, London, S.W.1.

THE travelling scholarship of the People's League of Health has been awarded to Miss Alice Gloyn, who has been in charge of the Camberwell Day Sanatorium since 1917. She will attend Dr. Rollier's course on heliotherapy at Leysin in Switzerland, and will also visit the Graucher and other institutions in France for the treatment of tuberculosis in children.

AS a memorial to the late Dr. Philip Hicks (a brother of Sir William Joynson-Hicks), senior medical officer of the Royal Midland Counties Home for Incurables, Leamington, a handsome shelter was dedicated and opened at the home on July 15th, by Sir Ernest Pollock. The shelter was erected by subscriptions from friends and patients of Dr. Hicks, and bears a memorial tablet.

FROM June 4th to 10th 54 cases of plague occurred in Egypt, including 3 in Alexandria, 2 in Port Said, and 1 in Suez.

THE fifth Carlsbad International Post-graduate Course, in which special attention will be given to medical hydrology and balneotherapy, will be held at Carlsbad from September 9th to 15th. Further information can be obtained from Dr. Edgar Ganz, Carlsbad.

WE regret to have to record the death of Dr. W. Ford Robertson, pathologist to the Scottish asylums. We hope to publish some account of his career in a later issue.

Letters, Notes, and Answers.

AUTHORS desiring reprints of their articles published in the BRITISH MEDICAL JOURNAL are requested to communicate with the Office, 429, Strand, W.C.2, on receipt of proof.

IN order to avoid delay, it is particularly requested that ALL letters on the editorial business of the JOURNAL be addressed to the Editor at the Office of the JOURNAL.

THE postal address of the BRITISH MEDICAL ASSOCIATION and BRITISH MEDICAL JOURNAL is 429, Strand, London, W.C.2. The telegraphic addresses are:

1. EDITOR of the BRITISH MEDICAL JOURNAL, *Aitiology, Westrand, London;* telephone, 2630, Gerrard.
2. FINANCIAL SECRETARY AND BUSINESS MANAGER (Advertisements, etc.), *Articulate, Westrand, London;* telephone, 2630, Gerrard.
3. MEDICAL SECRETARY, *Mediocera, Westrand, London;* telephone, 2630, Gerrard. The address of the Irish Office of the British Medical Association is 16, South Frederick Street, Dublin (telegrams: *Bacillus, Dublin;* telephone, 4737, Dublin), and of the Scottish Office, 6, Rutland Square, Edinburgh (telegrams: *Associate, Edinburgh;* telephone, 4361, Central).

QUERIES AND ANSWERS.

TRAINING OF A PARALYTIC.

DR. F. E. TAYLER (Trowbridge, Wilts) is concerned about the case of a young man aged 21, partially paralysed by an accident when 10 years of age, but able to walk, though with some difficulty. There is some slight inco-ordination of the hands, which, however, is said to be improving. Our correspondent wishes to hear of an institution where instruction in some such occupation as basket-making or bookbinding could be obtained. His mother is able to pay a small premium or make some contribution towards the cost of education.

COST OF SMALL MATERNITY HOSPITAL.

DR. E. S. ROBINSON (Stourport) asks for information as to the cost of (*a*) establishing and (*b*) running a small maternity home—say of four beds—in a small country town.

INCOME TAX.

"R. A. B.," New Zealand, arrived in England in April intending to return. What is his position as regards income tax?

*** He becomes liable as from the time he reached the United Kingdom if he remains here for six months of the financial year ending April 5th. His liability would include tax on his earnings and on income brought to or received in the United Kingdom, subject, of course, to the usual allowances.

"Y. Z. X." inquires up to what date, from April 5th, in the financial year may a person reside in England and not be liable to tax, where the present residence is in England but the intention is to reside permanently abroad.

*** There is no such date. A person residing in the United Kingdom is liable up to the date of his departure. "Y. Z. X." has been misled by the different case of a person *coming* to this country for a temporary purpose only.

"J. P. M." is resident abroad, having a Colonial salary and income from this country consisting of (*a*) War Loan interest received untaxed and (*b*) income taxed before receipt from other investments.

*** He can claim repayment—assuming he is a British subject—on a *proportion* of the allowances, according to the ratio of his taxed British income to his total income. The claim can be made to the Chief Inspector (Claims), Cecil Chambers, 86, Strand, W.C.2, to whom preliminary application should be made for the appropriate form of declaration.

"PERPLEXED" has attended a retired medical practitioner and his family constantly; he has never sent in an account for professional services, but has received a cheque from the retired practitioner with the remark that it is sent "as a gift." Is he liable to tax on it?

*** The view of the courts, as brought out in the case of Cooper *v.* Blakiston, appears to be that the liability depends on whether or not the payment is made for services rendered, with whatever expressions it may be attended. If our correspondent had been put to any expense—for example, petrol or drugs—in attending this retired practitioner and his family, would he not have excluded such expenses in making up his statement for taxation? Our correspondent may be able to decide the question for himself in the light of the foregoing.

"FORMOSA" asks: If the value of a purchased practice increases during the first year of the buyer's tenure, can the Inland Revenue demand figures and assess the buyer on his figures in place of the predecessor's average for the previous three years?

*** No; where one person succeeds to a practice the successor is liable on the three years' average profits of the practice. This would not necessarily cover the case of appointments held by the buyer but not by the seller. If the Revenue authorities rely on any special circumstances of the case perhaps "Formosa" will explain their nature.

HOMES FOR MENTAL CASES.

"J. R. L." asks what steps should be taken to regularize the position of the case of an old lady suffering from bodily weakness and delusions of suspicion; she is without means, but has been placed by friends in a nursing home where the matron receives her at a reduced fee. Our correspondent asks whether, if certifiable as of unsound mind, she can remain in a nursing home.

*** A patient who is certifiable as of unsound mind can be treated in a nursing home only if she is certified as a private patient in the usual way. The conditions under which a "single patient" may be received in a private house not licensed for the reception of lunatics are fully explained in Archbold's *Lunacy and Mental Deficiency*, fifth edition, pp. 578–586. Without lunacy certificates it is illegal for a person certifiable as of unsound mind to be treated in a nursing home, and the matron renders herself liable to prosecution even though she has taken her at reduced fees for charitable reasons. A patient in a nursing home who becomes certifiable should either be removed to the care of her relatives, certified and sent to a mental hospital, or certified as a "single patient" and the treatment continued in the home.

"INQUIRER" wishes to hear of a charitable institution where a certifiable insane gentlewoman can be received for a payment not exceeding £30 a year.

*** We do not know of any charitable institution taking mental cases certifiably insane for the sum indicated. Many county and borough mental hospitals take private cases, but since the cost of the pauper patients is greatly in excess of £30 per annum, the private patients could not be taken for a sum less than the pauper maintenance rate.

LETTERS, NOTES, ETC.

THE editors of the *Medical Directory* (7, Great Marlborough Street, London, W.) write: "The annual circular has been posted to every member of the medical profession. Most of the returns have already been received." They state that if any practitioner has not yet sent them the latest information they will be glad to receive it by an early post.

THE RADIOGRAPHIC LOCALIZATION OF SPINAL LESIONS BY SICARD'S METHOD.

MR. PERCY SARGENT, in the interesting note on the mechanical method for localization of spinal lesions devised by Professor Sicard published at page 174, states that the oily fluid used consists of "huile d'oeillette," containing 40 per cent. of iodine and remarkably opaque to the *x* rays. "Huile d'oeillette" is official in the *French Pharmacopoeia;* it is used as the basis of a number of preparations described therein. It is made from the seeds of *Papaver somniferum*. An examination of the oil by Martindale (*Extra Pharmacopoeia*) showed that it contained no narcotic nor alkaloidal constituents. It is in fact so largely used for mixing with olive oil to produce a salad oil that it has almost ceased to be regarded as an adulterant. The maximum amount of iodine that can be dissolved in the oil depends upon the "iodine number" of the oil; 40 per cent. is quite feasible in some instances, but the preparation must be carefully made. It is an additive compound of poppy-seed oil and iodine.

EPITHELIOMA CONTAGIOSUM OF FOWLS.

COLONEL MCCARRISON, in relating the experiment which forms the basis of his interesting paper published at page 172, mentions the constitutents of the diet upon which pigeons at Coonoor can be maintained in perfect health in captivity, but he does not explain the meaning of the terms he uses. We have, therefore, made some inquiries of Colonel D. G. Crawford, who informs us that *dal* is the name given in India to all sorts of pulses. *Mung dal* is a regular item of jail dietaries, and as served out is very like the split peas sold in this country. Green *mung dal* probably means green lentils. *Ragi* is a coarse millet. *Cholum* is probably the same thing as *chola* or *gram;* it is another variety of pulse, *Cicer arietinum*. It is generally used in India for feeding horses, but is sometimes eaten by man. It is the *cicer* or chickpea which Horace speaks of.

SKIN DISEASES IN ARMIES IN THE FIELD.

"CITIZEN SOLDIER" writes to take exception to a statement in the review of the second volume of the *Medical History of the War: Diseases of the War*, published in the JOURNAL of July 14th, page 66. The statement was to the effect that skin diseases as a cause of wastage did not gain the notice demanded until Colonel Soltau drew up in 1917 his memorandum on the classification of admissions to hospitals in the Second Army in France. Classification of causes of all admissions to hospitals was, our correspondent states, carried out systematically in that army from the first week of its formation by instruction of the D.M.S., Major-General Sir R. Porter, K.C.B., and was the subject of a weekly routine return which was circulated for information. The importance of preventable skin disease as a major cause of wastage was recognized and practical steps for repression considered by conferences held under the presidency of the D.M.S. This policy had been carried out even before Colonel Soltau's predecessor, the late Sir James Galloway, had been appointed consulting physician. The fact that wastage due to skin diseases was mainly preventable was recognized by the general staff, and the suitable technical measures recommended by the medical branch were carried out by the quartermaster-general's branch. Save for a few quiet periods the Second Army was a continually expanding force, with a narrow front of only twelve miles, behind which at the battle of Passchendaele lay over 800,000 men. The organization concurrently developed in the field for combating disease, preventable skin diseases among others, therefore involved a vast organization.

VACANCIES.

NOTIFICATIONS of offices vacant in universities, medical colleges, and of vacant resident and other appointments at hospitals, will be found at pages 26, 27, 30, 31, and 32 of our advertisement columns, and advertisements as to partnerships, assistantships, and locumtenencies at pages 28 and 29.

A short summary of vacant posts notified in the advertisement columns appears in the *Supplement* at page *92*.

SCALE OF CHARGES FOR ADVERTISEMENTS IN THE BRITISH MEDICAL JOURNAL.

	£	s.	d.
Six lines and under	0	9	0
Each additional line	0	1	6
Whole single column (three columns to page) ...	7	10	0
Half single column	3	15	0
Half page	10	0	0
Whole page	20	0	0

An average line contains six words.

All remittances by Post Office Orders must be made payable to the British Medical Association at the General Post Office, London. No responsibility will be accepted for any such remittance not so safeguarded.

Advertisements should be delivered, addressed to the Manager, 429, Strand, London, W.C.2, not later than the first post on Tuesday morning preceding publication, and, if not paid for at the time, should be accompanied by a reference.

NOTE.—It is against the rules of the Post Office to receive *poste restante* letters addressed either in initials or numbers.